Dredge guideline

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Cover picture: Flinders Ports dredging campaign. Photo taken by EPA staff using drone footage by David Kruss and Adam Lewis. EPA boat Diomedea (in the foreground) skippered by Matt Nelson.

Disclaimer

This publication is a guide only and does not necessarily provide adequate information in relation to every situation. This publication seeks to explain your possible obligations in a helpful and accessible way. In doing so, however, some detail may not be captured. It is important, therefore, that you seek information from the EPA itself regarding your possible obligations and, where appropriate, that you seek your own legal advice.

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Abbreviations

DA	development approval
DEW	Department for Environment and Water
DMP	dredge management plan
DIT	Department for Infrastructure and Transport
EPA	South Australian Environment Protection Authority
EP Act	Environment Protection Act 1993
EPPs	Environment Protection Policies
GED	general environmental duty
NAGD	National Assessment Guidelines for Dredging
NATA	National Association of Testing Authorities, Australia
PDI	Planning, Development and Infrastructure Act 2016
PFAS	per- and poly-fluoroalkyl substances
PIRSA	Primary Industries and Regions South Australia
SCAP	State Commission Assessment Panel

1 Purpose

Application of the Dredge Guideline will assist dredging proponents and licensees in meeting their general environmental duty under section 25 of the *Environment Protection Act 1993,* by demonstrating that all reasonable and practicable measures have been undertaken to minimise the potential for environmental harm.

It provides a broad overview on the Environment Protection Authority's (EPA) role in the development assessment and licensing of dredging activities and what dredging proponents need to do to meet their legislative requirements.

This will be achieved by:

- Highlighting legislation and regulation relevant to dredging including EPA referrals under the *Planning, Development and Infrastructure Act 2016* (PDI Act) and licensing requirements under the *Environment Protection Act 1993* (EP Act).
- Identifying potential environmental impacts associated with dredging activities and EPA's expectations on the environmental outcomes that must be achieved.
- Specifying what information will be required by the EPA to assess the environmental risk of proposed dredge campaigns referred under the PDI Act and for the EPA licensing process.
- Providing advice on the development of dredge management plans (DMP), monitoring programs and sediment analysis plans.

This guideline applies to all dredge campaigns. It does not provide specific technical guidance that differentiates between types of dredge equipment or the nature of the environment where dredging is proposed. Instead it aims to be outcome based enabling proponents and licensees to potentially adopt their own methodologies and still meet EPA legislative requirements. The guideline applies to all operational aspects of dredging including the deployment and operation of machinery during the dredging campaign, and the management of spoil removed from the dredge site. This guideline however, does not remove the need for proponents to utilise existing knowledge and experience from the dredging industry and consider best available technology that is economically achievable (BAT).

2 What is dredging

2.1 Definition of dredging

Dredging is a prescribed activity of environmental significance listed in Schedule 1 the *Environment Protection Act 1993* (EP Act) and is defined as:

> … removing solid matter from the bed of any marine waters or inland waters by any digging or suction apparatus, but excluding works carried out for the establishment of a visual aid to navigation and any lawful fishing or recreational activity.

For the purposes of this definition

- *Solid matter* includes but is not limited to seagrass wrack, algae wrack, sand, sediment, organic matter, rocks.
- *Marine waters* include the coastal waters of the state or any part of the sea that is within the limits of the state, and includes any estuary or tidal waters. This includes the intertidal zone whether wet or dry.
- *Inland waters* include any water occurring naturally above or under the ground; or water introduced to an aquifer or other area under the ground; or an artificially created body of water or stream that is for public use or enjoyment.
- *The bed of marine waters or inland waters* is the portion of substrate within waters. For marine waters this includes the intertidal zone below the mean high water mark. For inland waters this includes the substrate of a water body which confines the flow of waters but does not include the bank of a water body which confines water as they rise out of the bed.

Activities of prescribed environmental significance such as dredging can only be legally carried out with an environmental authorisation from the EPA predominantly in the form of a licence (see section 3.2.2). Table 1 identifies scenarios that fall into the definition of dredging and those that don't.

It is important to note that irrespective of whether an EPA licence is required or not, any works as described below will still need to meet legislative requirements and the general environmental duty where reasonable and practicable measures must be undertaken to prevent environmental harm. This can be achieved by following the requirements specified in this guideline.

Table 1 Dredge scenarios

This list is not exhaustive and if in doubt, it is strongly recommended to contact the EPA for advice.

The following scenarios are defined as dredging (but not limited to):
• Removal of solid matter from the bed of waters for marina construction or maintenance. • Removal of solid matter from the bed of waters for boat ramp construction or maintenance. • Laying of a pipe, cables, infrastructure in waters that involves the removal of sediment. • Removal of sediment from the bed of inland waters (while wet) or estuaries to improve flows or for flood mitigation. • Desilting of inland waters including streams, creeks and rivers (while wet) or estuaries. • Removal of contaminated sand or sediment from waters or an intertidal zone irrespective of whether the area is covered with waters or is dry. • Removal of aquatic vegetation from the bed of rivers/streams while undertaking construction activities that involves the removal of sediment from the bed of waters.

- Removal of beach wrack or other organic matter from below the mean high water mark.
- Construction, maintenance or removal of beach rock wall/jetty or other infrastructure that requires digging in the intertidal zone or within waters, and removal of solid matter from the site.
- Removal of sand from marine waters including the intertidal zone to improve flows.
- Removal of material from the bed of waters while the area is dry (maintained via coffer dam, bund or other physical means) if the area is normally under water. For example, if a coffer dam or bund is installed to make the area dry while undertaking the dredge campaign.
- Removal of material from the bed of waters for the purpose of removing waste products or decontamination.
- Levelling of the seabed for the purpose of removing built-up material (including beach wrack) where the solid material is removed from the site and results in changes to the depth of the seabed.
- Shifting of clean, uncontaminated beach sand from an intertidal zone for the purpose of beach replenishment.
- Shifting of clean, uncontaminated beach sand due to sand movement in an intertidal zone.

The following scenarios do not fall within the definition of dredging.

- Construction, maintenance or removal of beach rock wall/jetty or other infrastructure that does not require digging and removal of solid matter from the site.
- Laying of a pipe, cables, infrastructure that does not involve digging and removal of solid matter from the site.
- Any digging or suction of solid matter, including sand, from above the high water mark adjacent to marine waters.
- Maintenance of irrigation channels and stormwater infrastructure (eg wetlands, sedimentation basins) to improve flows and optimise performance.
- Removal of vegetation from the bed of inland waters that requires digging while dry, or no digging while wet, for the purposes of vegetation maintenance or to improve flows. Native vegetation clearance may require approval through Department for Environment and Water or a Water Affecting Activity Permit through Landscapes SA.
- Removal of vegetation from wetlands, stormwater treatment basins and other waterbodies, used for the purposes of stormwater treatment. Native vegetation clearance may require approval through Department for Environment and Water or a Water Affecting Activity Permit through Landscapes SA.
- Removal of sediment from inland waters while dry to improve flows. This may require a Water Affecting Activity Permit through Landscapes SA.
- Construction or removal of matting or other infrastructure used to minimise erosion that doesn't involve the removal of solid matter from the bed of waters. This may require a Water Affecting Activity Permit through Landscapes SA.
- Removal of material from a dry area that will be connected with state waters, eg a marina is dug out on land and then filled with water by removing the barrier. Note: maintenance dredging for a marina constructed using this method will be considered dredging.
- Levelling the seabed without removal of sediment to smooth out any mounds that may occur.
- Removal of waste from gross pollutant traps and stormwater sumps.
- Taking samples of solid matter for the purposes of sediment analysis for research, monitoring or assessment.

2.2 Capital versus maintenance dredging

Capital dredging is the excavation of solid matter (including organic matter) that occurs in an area which has previously not been dredged. By comparison, maintenance dredging means the excavation of material from the bed of any marine or inland waters for the purposes of maintaining a previously approved dredged volume (width, depth and length).

When proposing development that requires capital dredging, consideration should be given to undertaking the development so that ongoing maintenance dredging will not be needed or is minimised. Poorly located, designed or positioned break-walls, for example, create beach wrack sinks which require ongoing maintenance dredging to remove this material. Should maintenance dredging be required, it is important to be aware of the design history and approved dimensions of the dredge site (depth, area and shape) to ensure that no over-dredging occurs as this would inadvertently result in capital dredging.

2.3 Scope and life cycle of a dredge campaign

A dredge campaign involves a number of aspects which are identified in Figure 1. During the planning of a dredge campaign (Figure 2), the proponent will need identify impacts associated with each of these aspects and address how these impacts will be managed. EPA's expectations for managing impacts are outlined in section 4.

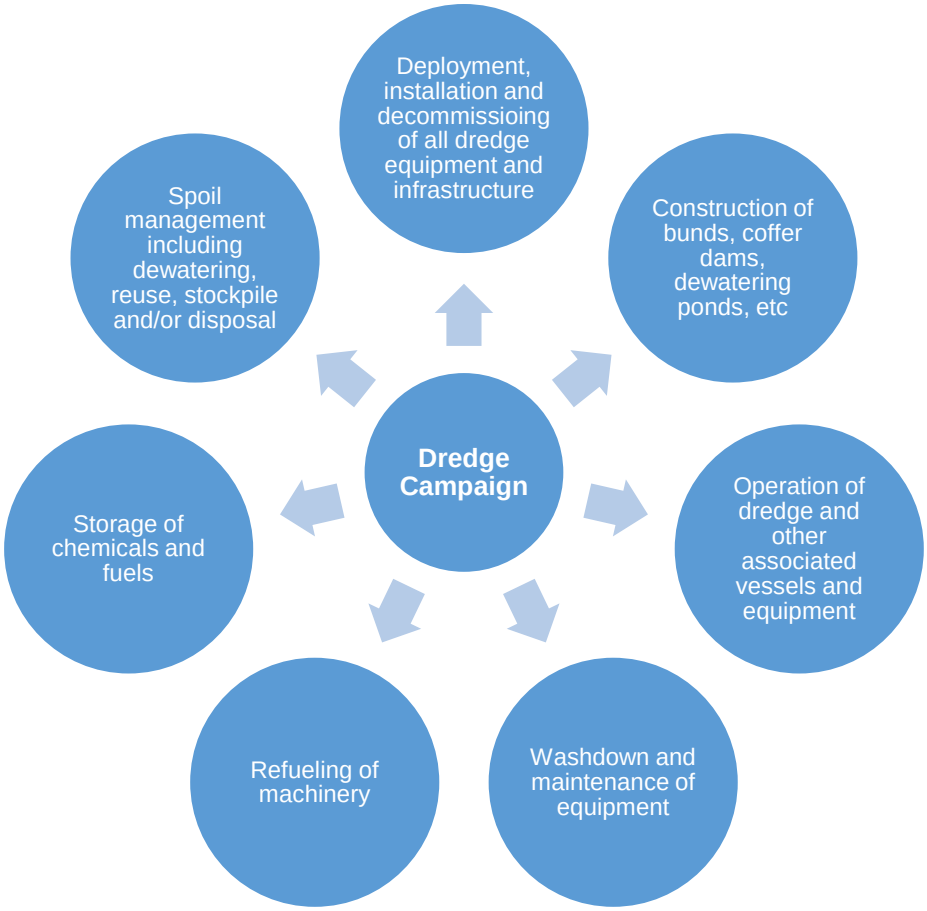


Figure 1 Aspects associated with dredging

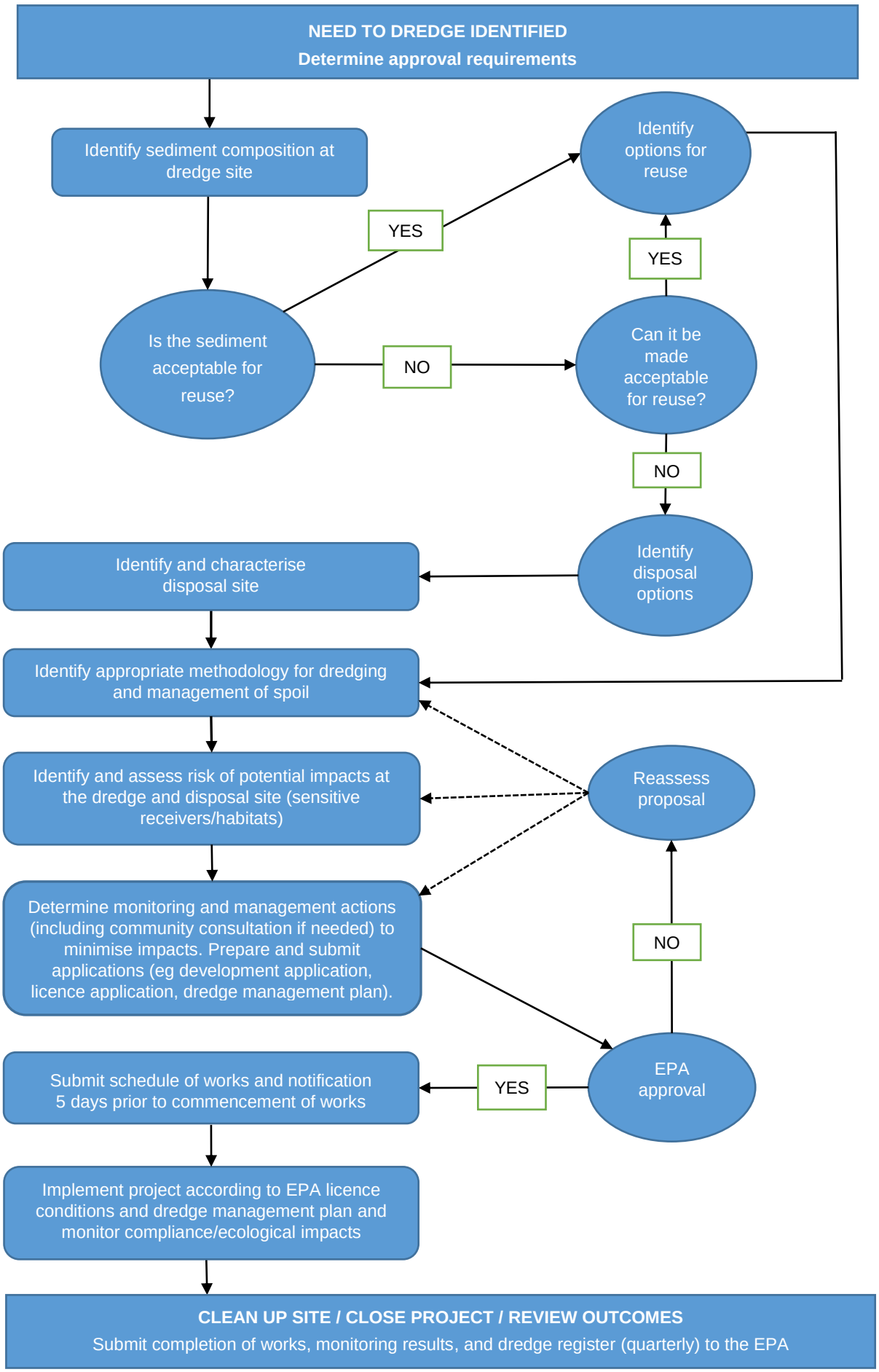


Figure 2 Stages of a dredge campaign

2.4 Types of dredging equipment

Dredging works are typically carried out under water, but can also occur in the intertidal zone (marine waters) and behind constructed bunds or coffer dams designed to maintain a dry dredge site. Equipment selected for the campaign must be fit for purpose, consider best available technology that is economical achievable (BAT) and is appropriate for the conditions where dredging is to occur. The type of dredge equipment used to remove spoil will depend on the nature of the solid matter to be removed, and the location of the dredge and dewatering site.

Types of dredge equipment may include but not limited to:

- Cutter suction dredger – predominantly used for removing harder material and generally does not generate fine sediment plumes at the cutter head. They generate a slurry of approximately 80% water and 20% solids (sediment/organic matter) which means that large volumes of water needs to be managed at the discharge and dewatering location. Material can be pumped up to 1,000 m via a pipeline or further with pump booster stations.
- Trailing suction hopper dredger – used to remove sandy and silty material and to carry materials long distances within the hopper, but may also generate fine sediment plumes at the dredging and disposal sites, particularly with overflow.
- Back hoe dredger – used to mechanically lift spoil or beach wrack from the dredge site. Depending on the type of material and the handling of the material by the operator, sediment plumes can be released during the lift phase of each cycle as the material dewaters *in situ* before being placed into a truck or barge (or similar). These dredges generate a spoil with a lower water content than suction dredges making it easier to manage for disposal, but depending on the size of the bucket, may have lower production rates and requires further handling and transport of the material either by barge or truck. Barge hoppers and truck storage should be impermeable. Back hoe dredges may require a hard stand area for access to the dredge material, and fill material should not be used for this.
- Grab dredger – used to mechanically lift spoil or beach wrack from the dredge site. Sediment plumes or a decline in dissolved oxygen can occur during the lift phase of each cycle as the material dewaters *in situ* before being placed into a truck or barge (or similar).
- Plough dredger and bed levellers – a plough is towed behind a tug along the seabed levelling high spots and ridges, moving the material to nearby low spots.
- Water injection dredger - consists of either a hydraulic or electric powered pump that jets water through nozzles spaced along a bar at pressure into the material to be dredged, forming a density cloud. The density cloud then disperses the material by gravity and or natural currents into the surrounding location. The jetting bar is controlled from either a vessel/barge or amphibious vehicle.
- Suction dredger - consists of either a hydraulic or electric power pump mounted on a frame or scraper and dragged over the bed of waters. The pump sucks the slurry of dislodged material and water and discharges it through a pipeline. It is controlled from either a vessel/barge or an amphibious vehicle. The slurry of material is pumped via the pipeline to the disposal location.
- Sand bypassing – the suction of sand via a pump and pipeline past a river entrance or groyne after it has accumulated using permanent structures built to capture littoral drift sand.
- Rakes/scarifier – used to remove debris, beach wrack by dragging the rake with a vessel and either placing the wrack in another location or removing the material.

2.5 Spoil management

Once material is removed from the dredge location it is known as spoil. The composition and quality of spoil and the nature of the location where it is to be stockpiled, dewatered, placed or disposed must be determined prior to it being removed from the dredge site. This will inform the most appropriate option for the management of spoil which is consistent with the waste management hierarchy. Guidance for analysis of spoil is presented in section 8.

Spoil varies in quality, consistency and type and these factors determine how the spoil should be managed and what methods should be used for each stage of the dredge campaign. In accordance with the EPA Waste Management Hierarchy, dredge spoil where possible should be treated as a resource. Potential reuse options for spoil should be considered when planning a proposed dredge campaign. Whatever method is chosen, the spoil needs to be fit for purpose and meet the EPA Standards for the production and use of waste derived fill or soil enhancer (WDF Standards). If spoil cannot be reused, it will need to be taken to an appropriate location for disposal (eg licensed landfill).

Spoil can be handled in a number of ways which may include but not be limited to:

- Reusing spoil for another purpose (Figure 3).
- Loading into a hopper, truck or bin and transported off site for placement elsewhere or for disposal.
- Pumping via a pipeline to an alternative location for dewatering, placement or disposal.
- Placing or discharging onto the beach above the high water mark to allow for it to be distributed slowly back into the marine environment.
- Pumping into sedimentation ponds or a swale (constructed above the high water mark) where fines gradually settle and water is discharged at a slow rate to minimise turbidity.
- Pumping into geofabric dewatering bags to contain spoil, remove fine material, and reduce impacts from odour, dust and turbidity.
- Side-casting spoil adjacent the dredge location when dredging works is undertaken for levelling out the bed of navigable waters or laying pipework. The spoil is also reused to cover and stabilise the pipe after it has been laid.

Further investigation will need to be undertaken to identify if spoil is contaminated. Contaminated spoil may include the presence of acid sulfate soils, plastics, petroleum products, metals, PFAS, etc. If spoil is assessed as having contaminants, it must be appropriately handled, stored (fully contained) and transported (by a licensed waste transporter to a facility licenced to receive that waste) so that it does not cause harm to land or waters.

Any contaminated material that is proposed to be dredged or encountered during dredging must be subject to management arrangements that have been approved by the EPA. Verification of the end fate of this material will also be required to be submitted to the EPA.

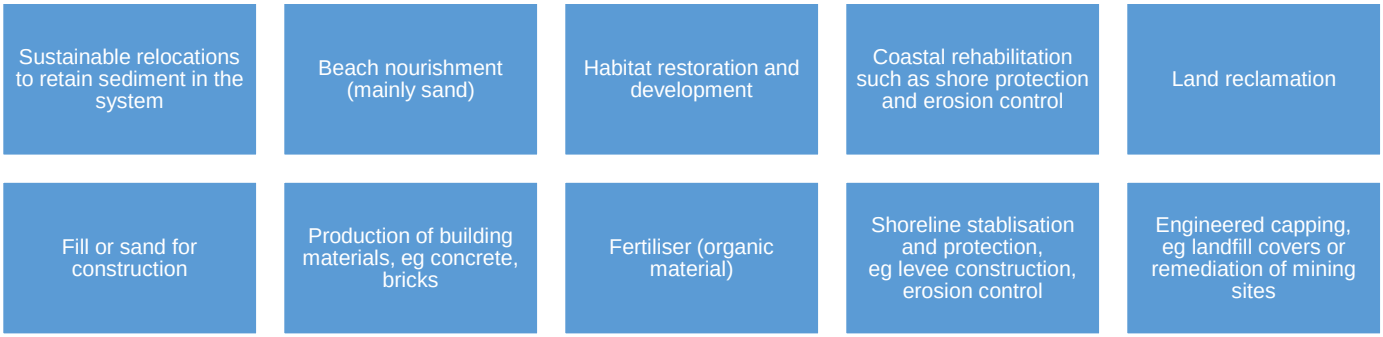


Figure 3 Reuse options for spoil

It is the EPA's position that dredge spoil be disposed of to land unless it is not practicable to do so or if disposal to land would have a greater environmental, social or economic impact than disposal to waters. Any disposal of spoil to the marine environment will need to comply with the principles of the National Assessment Guidelines for Dredging (NAGD) – refer to Figure 4. This is to ensure that all other options for spoil management have been considered and minimise impacts to aquatic flora and fauna that may result from marine disposal, particularly within nearshore environments.

Figure 4 A broad overview of the assessment framework for NAGD[1]

(please refer to the document for more detailed guidance on NAGD requirements).

[1] Taken from *National Assessment Guidelines for Dredging*, Commonwealth of Australia, Canberra, 2009, http://www.environment.gov.au/marine/publications/national-assessment-guidelines-dredging-2009

3 Legislative requirements

> The EPA's statutory role includes ensuring that all reasonable and practicable measures are taken to protect, restore and improve the environment, and to safeguard people's health and wellbeing through the regulation of pollution, radiation and waste management activities.
>
> – EPA Strategic Directions

3.1 EPA legislation relevant to dredging

All dredge licensees have a legal obligation to comply with the *Environment Protection Act 1993* (EP Act), environment protection policies (EPPs)[2], licence conditions, dredge management plans (DMP) and development approval conditions (where applicable).

> The *Environment Protection Act 1993* poses a general environmental duty (GED) on all persons where reasonable and practicable measures must be taken to prevent or minimise environmental harm. It is the responsibility of the dredge proponent and/or licensee to demonstrate that dredging activities can be undertaken to manage environmental risk and meet environmental outcomes. Failure to comply with GED in itself is not an offence however breaching environment protection policies and causing environmental harm is, and may result in the EPA issuing an expiation, environment protection or clean up order, or prosecution unless the contravention was not unlawful and GED was met.

Under EPA legislation, environmental harm is caused by depositing, discharging, emitting or disturbing a pollutant which includes any solid, liquid, gas, noise or heat. Pollutants emitted from activities associated with dredging may include sediments, contaminants such as metals and toxic substances, organic matter, plastics and noise. The potential for environmental harm that may result from dredging, dewatering and disposal of spoil will vary depending on the scale and location, and whether the dredging is capital or maintenance.

The key issues of particular legislative interest to the EPA include:

- Protection of water quality.
- Protection of habitats such as seagrass, mangroves and aquatic vegetation.
- Management of noise and air quality (principally dust and odour).
- Solid waste management and disposal.
- Storage, handling and disposal of hazardous substances.
- Ecological impacts to aquatic and terrestrial flora and fauna.

Further information on potential impacts associated with dredging and EPA expectations for managing these impacts are found in section 4 of this document.

[2] *Environment Protection (Air Quality) Policy 2016* (Air Quality Policy), *Environment Protection (Noise) Policy 2007* (Noise Policy), *Environment Protection (Water Quality) Policy 2015* (Water Quality Policy), and *Environment Protection (Waste to Resources) Policy 2010* (Waste to Resources Policy).

3.2 What approvals are needed (EPA)

The EPA has regulatory responsibilities under the *Environment Protection Act 1993* (EP Act) for licensing dredging and may have a role under the *Planning, Development and Infrastructure Act 2016* for dredging proposals referred to the EPA by the relevant planning authority.

The EPA assesses dredging campaigns to identify the risk for environmental impacts and how the proponent/licensee intends on managing those impacts. It is recommended that dredging proponents contact the EPA in the early stages of planning to obtain a better understanding of expectations of how the environmental impacts of their dredging and disposal/dewatering proposal should be assessed and managed.

3.2.1 Development approval

It is up to the proponent to contact their relevant planning authority to determine whether development approval and a referral to other government agencies including the EPA is required for their dredge campaign. The planning authority will then determine if a referral is required to other government agencies, including the EPA.

Dredging activities may require development approval through the relevant planning authority. For inland waters and coastal development, this is usually the local council. For Crown Development and dredging undertaken within marine waters, it is the State Commission Assessment Panel (SCAP).

The development proposal outlines the overall scope of the project. If required, the proposed dredge campaign is also assessed at this stage by other government departments including the EPA (as referred by the planning authority). The EPA may request further information from the proponent if the information presented in the development application is considered to be insufficient to undertake a thorough impact assessment of the proposed dredging project.

The EPA has the capacity to direct conditions or refusal of a development application if the residual risk of environmental harm is considered to be too high. For projects that have been approved as a Crown Development, the EPA can only provide advice. However the EPA can also refuse a licence application if the risks associated with the proposed dredge campaign cannot be appropriately managed.

Even though development applications for maintenance dredging (as defined in Part 9.1 of the Planning and Design Code[3]) are no longer referred to the EPA for assessment, they will still need to meet the requirements of this guideline. If this has not been achieved, the EPA may request an amendment to the proposal or refuse the licence and DMP. This may require a variation to the development approval. In addition, if planning approval for maintenance dredging has expired or if different methodology for maintenance dredging has been proposed, a referral to the EPA is likely to be required.

Further information on EPA's role in the planning system can be found on the EPA website: https://www.epa.sa.gov.au/business_and_industry/environmental_planning/epas_role_in_the_planning_system .

Information on the planning system can be found on the state government planning portal: www.plan.sa.gov.au

[3] Under the Planning and Design Code '*maintenance dredging*' means: *'the excavation of material from the bed of any marine or inland waters by any digging, cutting, suction or any other means for the purpose of maintaining a previously dredged (approved) depth, width and area in marine or inland waters'*

3.2.2 EPA licensing

Regardless of whether development approval from the planning authority is required or if a referral to the EPA was made, all dredging campaigns will require a licence from the EPA.

The licence regulates the activity of dredging as defined in section 2.1. It includes conditions under which a licensee must operate to ensure compliance with the EP Act and relevant environment protection policies.

The licensing process is also used to determine the suitability of an applicant as a fit and proper person to hold an environmental authorisation, assess compliance with conditions of development approval (if applicable) and to ensure activities associated with the dredging campaign are managed appropriately through compliance with licensing conditions. Generally, the licence is held by the contractor undertaking the dredging works. However, in accordance with section 36(2) of the EP Act, the EPA may determine the licence should be issued to another entity who will be principally responsible for managing the project.

A site-specific licence will be required for dredge proposals assessed as being of higher risk to the environment. This allows for unique conditions to be included in the licence which address key elements of the proposal and which may be site specific.

Verification of the DA must be provided with the licence application, and again with the dredging notification (a licence requirement). Verification of the DA includes the Development Approval number and a copy of the DA conditions. Where a DA is not required, a letter from the planning authority must be provided to the EPA stating this is the case.

If a DA and referral to EPA is required, the EPA will undertake the majority of its assessment during the development assessment process. However the EPA may seek further information during the licence assessment process particularly if:

- The DA proponent was different to the EPA licensee who will be undertaking the dredging campaign.
- A development application was not referred to the EPA for assessment (eg maintenance dredging in marine waters and works undertaken for state government agencies).
- Changes to the proposal after development approval had been granted.

Where a DA is not required or has not been referred to the EPA for assessment (either through planning authority consent, when undertaking works for a state government agency or for maintenance dredging), the EPA will require approximately 20 business days (dependant on the nature and scale of the project) to assess the licence application and associated dredge management plan (DMP). Additional time is required to assess these projects as the associated environmental risks were not previously assessed at the DA stage.

Information collated during both the DA and licensing process will be used to inform licence conditions and EPA requirements for the development of the DMP and environmental monitoring. The licence application process typically takes around two months (dependant on the nature and scale of the project and whether all information is provided with acceptable detail). The timeframe includes the statutory requirement for a minimum two-week public notification. Any submissions received from the public notification process must be addressed by the applicant at this stage. Conditions of licence are then drafted, followed by payment of the licence fee before the licence issued[4].

[4] https://www.epa.sa.gov.au/business_and_industry/applying_for_a_licence

Prior to dredging, notification to the EPA is required. A condition of licence requires the EPA be notified with a minimum of five business days' notice. The purpose of the notification is to ensure the EPA are aware that works at a location are about to occur, to provide this information to the public that make enquiries or complaints, for the EPA to ensure that there is an approved DMP in place and allow for a site inspection to be scheduled if required. Notification of dredging works should be completed online via the ELF system.

During the dredge campaign, the EPA may assess compliance with licence conditions, relevant environment protection policies and legislation. Enforcement may be required if non-compliances are apparent. Enforcement initiated by the EPA may incur significant penalties if activities conducted are causing or have the potential to cause environmental harm. This may include expiation notices, environment protection or clean up orders, and prosecution.

Upon completion of the dredge campaign the licensee must submit a completion of works report which requests information on the decommission and removal of all plant equipment and vessels associated with the works, volume of spoil that was removed and verification of the spoil's fate, and any monitoring data that was collated.

Licence conditions require the submission of quarterly dredging registers. These registers are to be submitted in accordance with licence conditions and identify the number of days and the location where dredging occurred during that quarter. Even if no dredging was undertaken, a register must be submitted as nil. The dredging activities identified in the register are charged an environmental management fee for each day of dredging[5]. Dredging registers should be submitted online via the Environment Licensing Forms (ELF) portal.

Earthworks drainage (EWD) will no longer be a required activity for a dredging licence for the purposes of dewatering spoil. This component will now be assessed and managed under the dredging activity. EWD for the purposes of dewatering during construction activities will still require a licence as per Schedule 1 of the EP Act.

3.2.3 Dredge management plans (DMP)

A dredge management plan (DMP) must be prepared by a suitably qualified person and submitted to the satisfaction of the EPA (approved in writing) **prior** to the commencement of any dredging works.

A DMP is a requirement of a dredge licence and confirms the scope, methodology, environmental management, contingency and incident response arrangements for the dredge campaign. Although the EPA does not require submission of a DMP as part of the development application process, the proponent can choose to submit information for their application in the form of a DMP. This approach should also help simplify the assessment process during the licence application stage. Further guidance on the preparation of DMPs, monitoring plans is provided in section 6 (DMPs) and section 7 (Environmental monitoring programs).

The DMP needs to contain sufficient information for the EPA and/or the relevant authority to be confident that potential impacts on the environment, and public health and amenity have been identified and suitable measures to mitigate those impacts will be applied for the entirety of the project. A DMP will need to include a water quality monitoring plan and community consultation/communication requirements.

Communication and consultation with communities

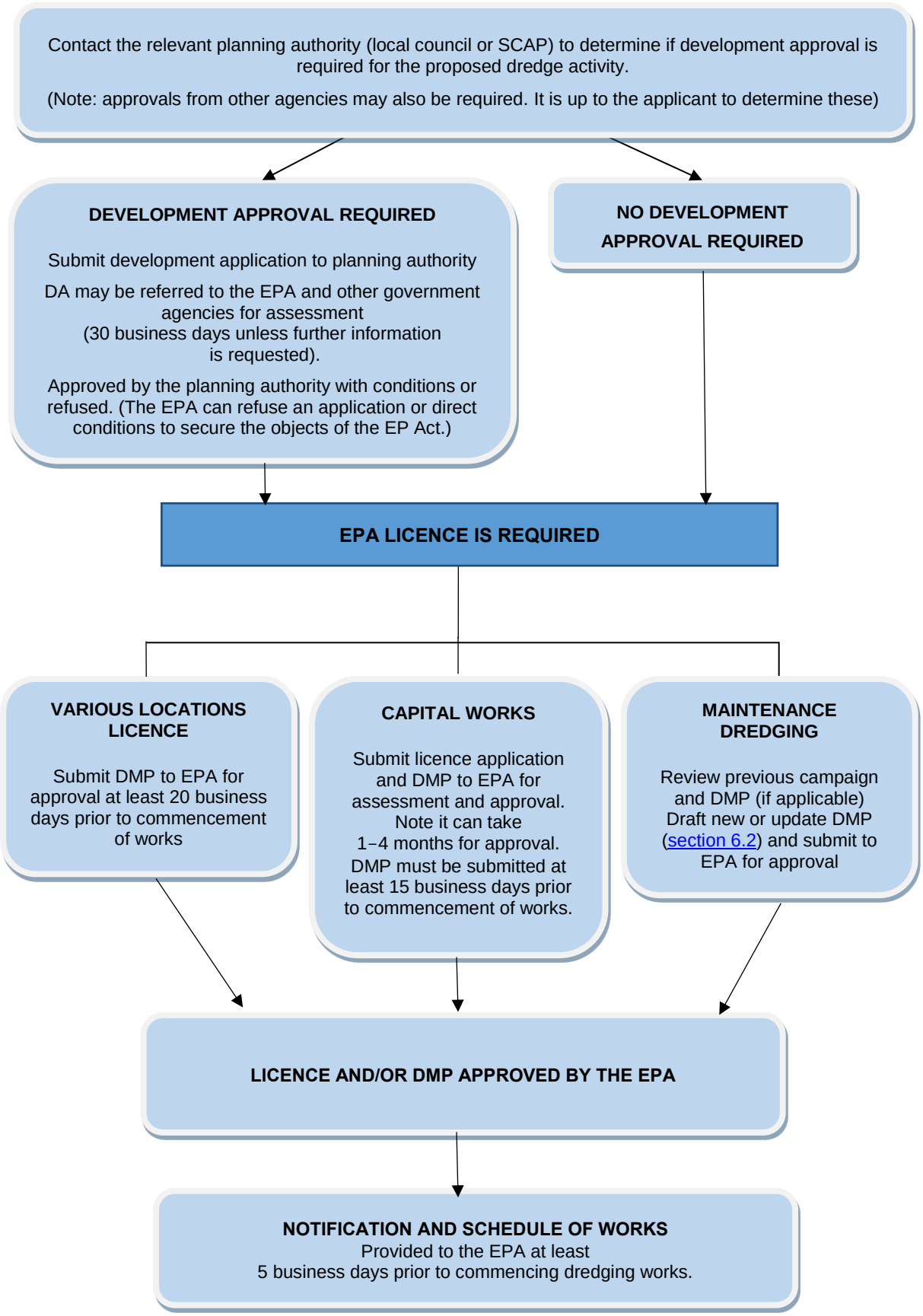
Due to the nature of dredging activities there is a potential for nearby residents to be adversely affected by noise and odour. The local community may also be concerned with the potential for environmental harm in their locality. Maintaining open and constructive communications with potentially affected parties can help to reduce conflicts and complaints and provide a number of benefits including:

[5] https://www.epa.sa.gov.au/business_and_industry/licence_fee_system/components#environment

- an improved information base by accessing information held by other stakeholders, not just those promoting the project;
- development of consensus by identifying and acknowledging shared views and objectives;
- establishing ownership of the decision-making process and its outcomes;
- resolution of different views through early and open discussion and through clear, transparent processes and procedures;
- extending understanding of technical issues, such as physical processes and the changing nature of risk, and the nature of the proposal;
- establishing links and networks useful in implementation of recommendations;
- identifying key issues of importance to stakeholders.

Further guidance on developing consultation plans can be found in the EPA Guideline for community engagement.

3.3 The Approval Process (EPA)



Further information on applying for an EPA licence can be found on EPA's website.
https://www.epa.sa.gov.au/business_and_industry/applying_for_a_licence

3.4 Other agencies

This guideline primarily reflects EPA requirements and does not include environmental legislation administered by other agencies which may apply to dredging activities. The guideline does however highlight relevant legislation that may be applicable for dredge campaigns. It remains the responsibility of the dredge proponents to contact other relevant agencies for guidance on required approvals and comply with all legislation, whether or not that legislation is referred to in this document.

Table 2 Requirements of Commonwealth and state government agencies.
Information correct as of the date of the release of these guidelines.

SOUTH AUSTRALIA			
Issue	**Agency**	**Legislation**	**Resources**
Various environmental issues	DEW	Numerous	DEW DA Checklist
Clearance of native vegetation. This includes aquatic plants and seagrass.	DEW	*Native Vegetation Act 1991*	Permit requirements
Activity within Marine Parks and Marine Reserves	DEW	*Marine Parks Act 2007*	Permits requirements General information
Activity in coastal environments – protect coastal habitats and sensitive species from erosion, damage, deterioration, pollution and misuse.	Coast Protection Board	*Coast Protection Act 1972*	Approval requirements General Information
Activities that may have an effect on national and conservation parks or native wildlife including shorebirds.	DEW	*National Parks and Wildlife Act 1972* *Environment Protection and Biodiversity Conservation Act 1999*	General Information
Shipwrecks – damage, destroying, interfering with, removing or disposing of an historic shipwreck or relic.	DEW	*Historic Shipwrecks Act 1981*	Permits requirements General information
Impacts on the behaviour and survival of marine wildlife including protected species	DEW/EPA PIRSA	*Adelaide Dolphin Sanctuary Act 2005* *National Parks and Wildlife Act 1972* *National Parks and Wildlife (Protected Animals – Marine Mammals) Regulations 2010* *Fisheries Management Act 2007*	The Act Permits and Exemption

SOUTH AUSTRALIA			
Issue	**Agency**	**Legislation**	**Resources**
Water affecting activities (inland waters) that may impact health and condition of water resources, eg construction of dams and water crossings, excavating material from watercourses, removal of reeds.	Landscape SA	*Landscape South Australia Act 2019*	Requirements for Water Affecting Activity Permits Landscape SA Regions
Biosecurity (both aquatic pests eg *Caulerpa taxifolia*, and diseases eg POMs which may be present in spoil, ballast water and biofouling)	Primary Industries and Regions South Australia (PIRSA) Landscape SA	*Livestock Act 1997* *Fisheries Management Act 2007* *Landscape South Australia Act 2019*	General Information Biofouling and ballast water Aquatic Pests Aquatic Diseases Landscape SA
Land ownership/management of dredge and spoil disposal locations	Local councils Department for Infrastructure and Transport (DIT) Crown Lands, DEW	*Local Government Act 1999* *Harbors and Navigation Act 1993* *Crown Land Management Act 2009*	SA Planning Portal DEW Requirements
Development	Local councils State Commission Assessment Panel (SCAP)	*Planning, Development and Infrastructure Act 2016* *Development Act 1993*	SA Planning Portal
Protection of sites of significance according to Aboriginal tradition and sites significant to Aboriginal archaeology, anthropology and history.	Department of the Premier and Cabinet	*Aboriginal Heritage Act 1988*	Guidance on Aboriginal Heritage

COMMONWEALTH			
Issue	**Agency**	**Legislation**	**Resources**
Matters of National Environmental Significance	Department of Environment and Energy	*Environment Protection and Biodiversity Conservation Act 1999*	General information and permit requirements
Disposal of dredge spoil in Australian waters. Note: the majority of dredging undertaken	Australian Maritime Safety Authority	*Environment Protection (Sea Dumping) Act 1991*	General Information Permit requirements

COMMONWEALTH			
Issue	**Agency**	**Legislation**	**Resources**
within SA occurs in state waters (including Spencer Gulf and Gulf St Vincent) therefore the application of the Sea Dumping Act rarely applies.			
Management of ballast water and entry of vessels and other infrastructure from international waters.	Department of Agriculture, Water and the Environment	*Biosecurity Act 2015*	General information Ballast water Vessel entry Marine Pest Information

4 Environmental Impacts of dredging and EPA expectations

There are a number of environmental impacts associated with dredging activities. The nature and extent of these impacts depends on a number of factors including the environment and location in which the dredging is undertaken and vicinity to sensitive habitats or receivers, the type and operation of equipment used for dredging, and the nature and management of the spoil that is removed during dredging.

It is up to the licensee to manage impacts that may result from their dredging campaign and minimise the potential for environmental harm. The EPA will expect environmental impacts to be appropriately managed by selecting the best available equipment and adopting management techniques that are economically appropriate for the nature of the location and the spoil that is to be removed.

The flow charts presented in this section broadly categorises risks according to what *may* be considered as high, medium or low. It also identifies what factors may alter risk, provides potential operational controls that may reduce the risk of these impacts occurring and what management practices may considered according to risk category. It is a guide only and will not be used as a final decision-making tool as it does not appropriately consider the interaction between these factors, eg the risk associated with dredging 2,000 m^3 of spoil will depend on other factors such as the composition of the spoil, contamination, sediment type, location of sensitive receivers etc. The information provided by proponents will be used to undertake a more detailed risk assessment that will be used by the EPA to inform the development of more site-specific conditions (development and licensing) and monitoring requirements if applicable. Information requirements for development referrals, licence applications and DMP are outlined in section 5.

The term 'MUST' used in this section is where failure to meet with specified action will, in the EPA's view, expose the environment to a risk of harm or may lead to a breach of the EP Act or relevant environment protection policies.

4.1 General environmental duty

According to section 25 of the *Environment Protection Act 1993* (EP Act), all persons when undertaking an activity that may pollute has a general environmental duty to take all reasonable and practicable measures to prevent or minimise any resulting environmental harm[6]. Therefore, any activities associated with dredging must be carried out in a manner that do not cause environmental harm or that aim to minimise the extent of harm.

DREDGE APPLICANTS OR LICENSEES MUST	
1	Consider whether there are other options available that avoid the need to dredge.
2	Undertake dredging in a manner that avoids the need for maintenance dredging or requires less frequent maintenance dredging.
3	Be aware of the potential impacts that may occur during dredging and identify and implement measures that mitigate these impacts.
4	Provide evidence to demonstrate that all reasonable and practicable measures have been undertaken to avoid or minimise the potential for environmental harm or nuisance. This may include use or selection of best available

[6] Under EPA legislation, environmental harm is caused by depositing or discharging a pollutant which includes any solid, liquid, gas or heat.

DREDGE APPLICANTS OR LICENSEES MUST	
	technology, implementation of environmental monitoring which informs management actions, community consultation, or timing of the works etc.
5	Ensure that an EPA approved DMP is developed and complied with during the dredge campaign and that any changes to the campaign are reflected in the DMP and approved by the EPA.
6	Demonstrate compliance with licence conditions and requirements specified in the DMP.

4.2 Water quality

Objective: To take all reasonable and practicable measures to prevent the discharge or deposit of pollutants into the state's marine, estuarine and inland waters and minimise the potential for environmental harm.

The *Environment Protection (Water Quality) Policy 2015* (Water Quality Policy) provides the structure for regulation and management of water quality in South Australian inland surface waters, marine waters and groundwater.

All dredge operators must ensure their activities meet the objectives of the Water Quality Policy and do not cause environmental harm. For the purposes of section 5(1)(b) of the EP Act, clause 5 of the Water Quality Policy defines environmental harm in relation to waters to be:

- loss of seagrass or other native aquatic vegetation from the waters
- a reduction in numbers of any native species of aquatic animal or insect in or in the vicinity of the waters
- an increase in numbers of any non-native species of aquatic animal or insect in or in the vicinity of the waters
- a reduction in numbers of aquatic organisms necessary to maintain the health of the ecosystem of the waters
- an increase in algal or aquatic plant growth in the waters
- the waters becoming toxic to vegetation on land
- the waters becoming harmful or offensive to humans, livestock or native animals
- an increase in turbidity or sediment levels of the waters.

Water quality impacts from dredging are caused by the mobilisation of sediment and/or organic matter from removing spoil or beach wrack from the dredge site, overflow of supernatant water, propeller wash from dredging vessels and auxiliary vessels or from dewatering spoil. This may result in turbidity plumes and/or decreases in dissolved oxygen. If water quality is not managed appropriately, this can result in environmental harm such as loss of aquatic vegetation and impacts to animals.

Impacts from turbidity and/or low dissolved oxygen will primarily depend on the sediment size at the dredge location, amount of organic matter or anoxic sediments present in the spoil, the duration of the dredge campaign and proximity from sensitive receivers. Fine sediments and clays are more likely to remain in suspension for a longer period of time and over a greater distance, and are more likely to become resuspended once the dredge campaign has been completed. This can increase the risk of vegetation loss from either direct smothering, or reducing light penetration which impacts the capacity for plants, seagrass and algae to photosynthesise and grow. Accumulation of sediments on rocky substrates may also hinder the attachment of algae and sessile animals to these surfaces.

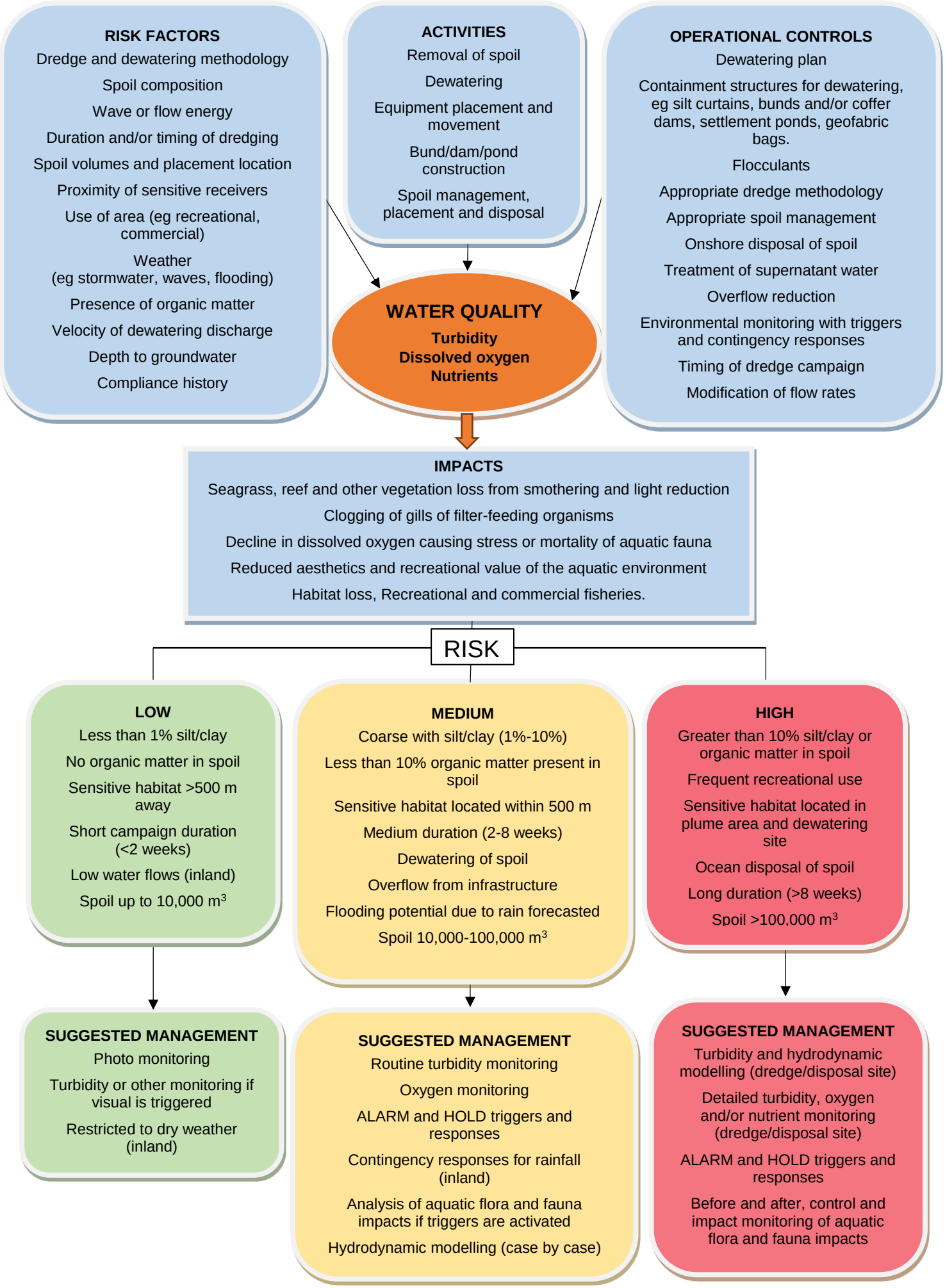
Loss of vegetation from increased turbidity and accumulation of sediments may have a cascading effect on organisms which rely on aquatic vegetation for food, and protection from predators. Aquatic fauna can also be directly impacted from the suspension of fine particles which can clog their gills or impact their ability to feed. Reduced dissolved oxygen can result in fish kills or increased mortalities in other organisms that have a reduced ability to move away from the dredge area. Aquatic vegetation also captures and stores carbon, assimilates nutrients, regulates water flow and minimises erosion.

Poor water quality can also affect primary industries such as fisheries and aquaculture, and the recreational and aesthetic value of waters, potentially making them unsafe or undesirable for swimmers. In addition, aquatic habitats can have significant cultural and conservation values.

It is important to consider timing of dredging works to take into account when impacts from poor water quality are likely to be minimised. For example, apex seagrass species like *Amphibolis* and *Posidonia* are more likely to be impacted during summer than over winter as they need this time to store energy to support their survival during the cooler and darker months. As such, dredging projects that are adjacent to seagrass beds will need more stringent management and monitoring requirements if dredging is to be undertaken during summer. In comparison, inland dredging campaigns may be better conducted over the summer months when watercourses are more likely to be dry. Dredging activities that may impact recreational activities such as swimming may best be undertaken during winter.

The level of impacts would expect to decrease moving further away from the dredge site and will depend on wind, tides and currents, sediment release rates (ie sediment characteristics) and dredge operation management. For projects which present a greater risk to seagrass or reef habitats, modelling would be required to identify the spatial scale of predicted impacts and used to assess the effectiveness of the proposed management.

It is recognised that increases in turbidity can arise in the aquatic environment as a result of storms and wave action. Aquatic flora and fauna can withstand short periods of elevated turbidity but when this is prolonged, environmental impacts can occur. Dredging can result in periods of turbidity which are longer than those caused by episodic events such as storms, rainfall and/or natural water flows. In addition, turbidity plumes resulting from dredging and dewatering are often caused by subsoil sediments exposed through the dredging process and are not normally released into the environment.


RISK FACTORS
Dredge and dewatering methodology
Spoil composition
Wave or flow energy
Duration and/or timing of dredging
Spoil volumes and placement location
Proximity of sensitive receivers
Use of area (eg recreational, commercial)
Weather (eg stormwater, waves, flooding)
Presence of organic matter
Velocity of dewatering discharge
Depth to groundwater
Compliance history
ACTIVITIES
Removal of spoil
Dewatering
Equipment placement and movement
Bund/dam/pond construction
Spoil management, placement and disposal
OPERATIONAL CONTROLS
Dewatering plan
Containment structures for dewatering, eg silt curtains, bunds and/or coffer dams, settlement ponds, geofabric bags.
Flocculants
Appropriate dredge methodology
Appropriate spoil management
Onshore disposal of spoil
Treatment of supernatant water
Overflow reduction
Environmental monitoring with triggers and contingency responses
Timing of dredge campaign
Modification of flow rates
WATER QUALITY
Turbidity
Dissolved oxygen
Nutrients
IMPACTS
Seagrass, reef and other vegetation loss from smothering and light reduction
Clogging of gills of filter-feeding organisms
Decline in dissolved oxygen causing stress or mortality of aquatic fauna
Reduced aesthetics and recreational value of the aquatic environment
Habitat loss, Recreational and commercial fisheries.
RISK
LOW
Less than 1% silt/clay
No organic matter in spoil
Sensitive habitat >500 m away
Short campaign duration (<2 weeks)
Low water flows (inland)
Spoil up to 10,000 m3
MEDIUM
Coarse with silt/clay (1%-10%)
Less than 10% organic matter present in spoil
Sensitive habitat located within 500 m
Medium duration (2-8 weeks)
Dewatering of spoil
Overflow from infrastructure
Flooding potential due to rain forecasted
Spoil 10,000-100,000 m3
HIGH
Greater than 10% silt/clay or organic matter in spoil
Frequent recreational use
Sensitive habitat located in plume area and dewatering site
Ocean disposal of spoil
Long duration (>8 weeks)
Spoil >100,000 m3
SUGGESTED MANAGEMENT
Photo monitoring
Turbidity or other monitoring if visual is triggered
Restricted to dry weather (inland)
SUGGESTED MANAGEMENT
Routine turbidity monitoring
Oxygen monitoring
ALARM and HOLD triggers and responses
Contingency responses for rainfall (inland)
Analysis of aquatic flora and fauna impacts if triggers are activated
Hydrodynamic modelling (case by case)
SUGGESTED MANAGEMENT
Turbidity and hydrodynamic modelling (dredge/disposal site)
Detailed turbidity, oxygen and/or nutrient monitoring (dredge/disposal site)
ALARM and HOLD triggers and responses
Before and after, control and impact monitoring of aquatic flora and fauna impacts

DREDGE APPLICANTS OR LICENSEES MUST
1 Not cause environmental harm as defined in the Water Quality Policy.
2 Identify sediment composition to ensure that appropriate management techniques for both dredging and dewatering are implemented.
3 Select dredging equipment and dewatering methods to minimise impacts to water quality including turbidity and declines in dissolved oxygen and that is appropriate for the nature of the dredge site and spoil.
4 Consider the waste management hierarchy for the management of spoil and discharge of wastewater from dewatering activities.
5 Identify the location of sensitive receivers that may be impacted by the dredging campaign.
6 Take reasonable and practicable measures to avoid impacting sensitive receivers from suspended sediment, reduced oxygen levels, elevated nutrients or release of contaminants and metals.
7 Undertake dredging in a manner and during time periods that minimise the potential for impacts to seagrass, reef, recreational users, commercial fishing and aquaculture, and breeding or migratory seasons for aquatic or terrestrial species.
8 Take reasonable and practicable measures to ensure that overflow water or the discharge of supernatant water during the dewatering process does not cause environmental harm. This may include water quality monitoring, disposal above the mean high water mark, increasing settlement time prior to discharge, reducing supernatant flow velocity, treatment of water prior to discharge by using containment structures such as geo-textile dewatering bags, silt buster, or settlement ponds or use of flocculants if appropriate to do so.
9 Undertake dewatering of spoil in a manner that minimises the potential for turbidity plumes and release of contaminants (eg hazardous substances, debris). This may need to take into consideration the location of the dewatering site or composition of material that is used to construct dewatering infrastructure.
10 Not discharge polluted water during dewatering if it is contaminated (eg with plastics or hazardous substances).
11 Comply with the NAGD guidelines for the placement of spoil within marine waters.
12 Undertake appropriate monitoring and adaptive management arrangements to minimise impacts to water quality to prevent and minimise environmental harm at the dredge site, disposal site and/or the dewatering location.

4.3 Noise

Objective: To minimise the impact of noise on sensitive receivers including residences, aquatic fauna, visitors to the area and other industries.

Noise is regulated by the EPA via the *Environment Protection (Noise) Policy 2007* (Noise Policy) which applies only to the impact of noise on humans. Noise from dredging operations (dredge vessels, dewatering locations and site compound) must not exceed the limits specified in the Noise Policy.

The operation of dredging equipment and associated machinery (eg generators, pumps, trucks, anchors) is likely to cause off-site impacts when occurring near residents, businesses and frequently used areas. Impacts include lack of sleep, annoyance and stress. It is acknowledged that in the majority of cases, noise from dredging is unavoidable. The EPA's regulatory approach seeks to achieve a balance between the need for dredging to occur and providing acceptable amenity for nearby residents and other sensitive receivers.

The 300-m evaluation distance specified in the *Evaluation distances for effective air quality and noise management* for dredging will, under most circumstances, be sufficient to protect sensitive receivers (residents, businesses, community facilities, industry, sporting clubs) against adverse noise impacts, provided the dredging activities are undertaken during the less sensitive daytime hours (7 am to 7 pm) Monday to Saturday. For distances less than 300 m, or where night works (between 7 pm and 7 am) are proposed, further assessment will be required to identify if noise may be an impact

and whether they can be effectively managed. A description on how noise will be managed will need to be included in the dredge management plan (DMP).

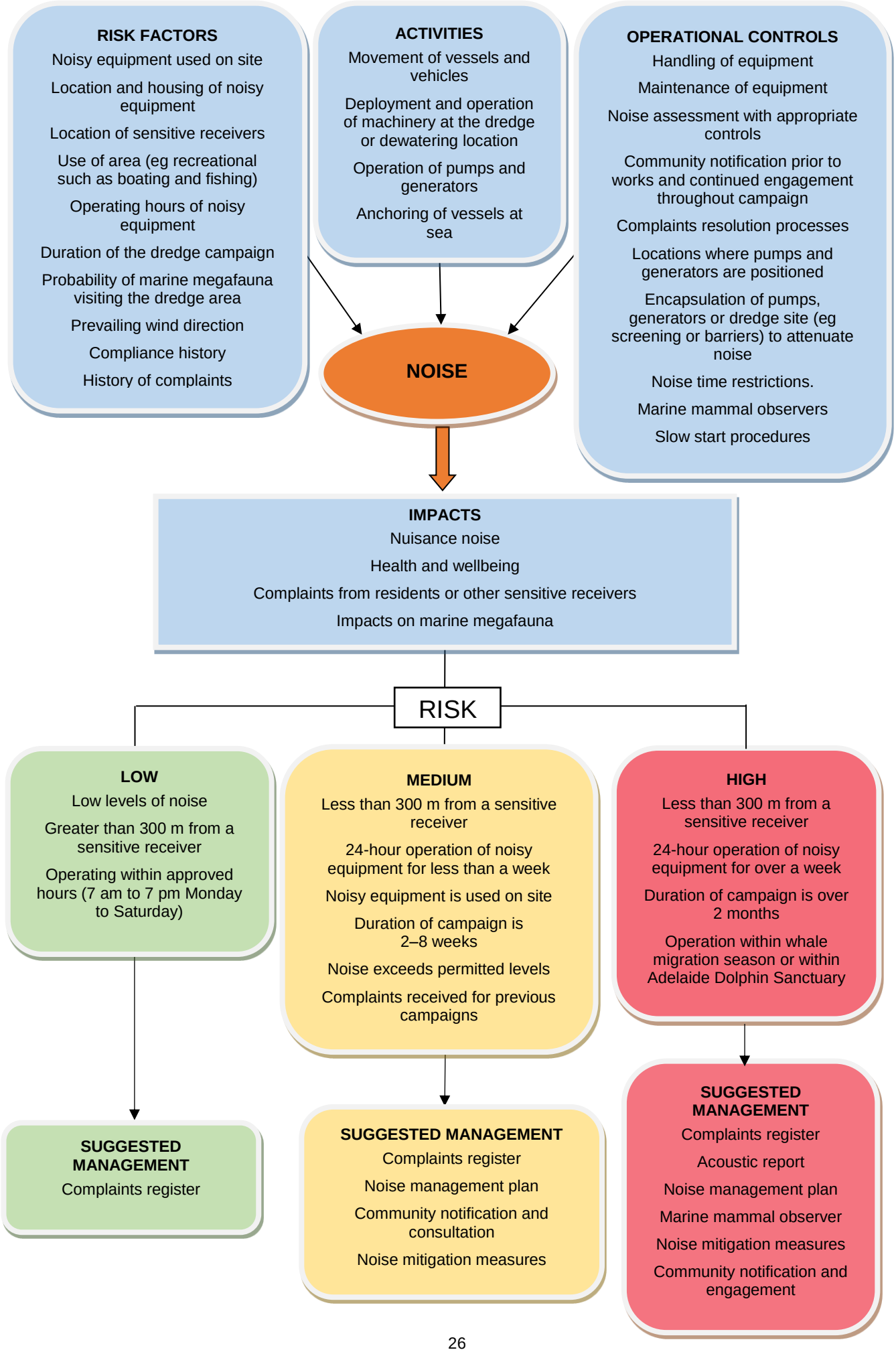
For campaigns that may be undertaken over long duration and are near to sensitive receivers or undertaken over 24-hour periods, it may be necessary for an environmental noise assessment in the form of an acoustic report[7] to be prepared depending on the duration and nature of the dredge campaign and the number of sensitive receivers that may be impacted by noise.

The noise assessment should provide an indication of the expected noise level, as well as details of all reasonable and practicable measures which will be taken to reduce off-site noise impacts. In addition, where night works are proposed, justification for undertaking the activities should also be included. Further information regarding the management of construction noise associated with development approval consent can be found in the EPA Information Sheet on Construction Noise.

Construction noise associated with public infrastructure is exempt from the construction noise requirements of the Noise Policy, however reasonable and practicable measures still need to be taken to minimise impacts of noise to sensitive receivers.

Underwater noise may also impact marine megafauna such as whales and dolphins particularly when activities such as piling occurs. Dredge operators need to consider movements of megafauna to ensure the potential for noise impacts are minimised. For any dredging that occurs within the Port Adelaide River Estuary and Barker Inlet, proponents also need to consider the requirements for the Adelaide Dolphin Sanctuary. Marine mammal observers may be required to avoid impacts to marine megafauna.

[7] Acoustic reports should be prepared by an acoustic engineer, being a person having sufficient skills, qualifications and experience to qualify for membership of the Australian Acoustical Society and Engineers Australia.


RISK FACTORS
Noisy equipment used on site
Location and housing of noisy equipment
Location of sensitive receivers
Use of area (eg recreational such as boating and fishing)
Operating hours of noisy equipment
Duration of the dredge campaign
Probability of marine megafauna visiting the dredge area
Prevailing wind direction
Compliance history
History of complaints
ACTIVITIES
Movement of vessels and vehicles
Deployment and operation of machinery at the dredge or dewatering location
Operation of pumps and generators
Anchoring of vessels at sea
OPERATIONAL CONTROLS
Handling of equipment
Maintenance of equipment
Noise assessment with appropriate controls
Community notification prior to works and continued engagement throughout campaign
Complaints resolution processes
Locations where pumps and generators are positioned
Encapsulation of pumps, generators or dredge site (eg screening or barriers) to attenuate noise
Noise time restrictions.
Marine mammal observers
Slow start procedures
NOISE
IMPACTS
Nuisance noise
Health and wellbeing
Complaints from residents or other sensitive receivers
Impacts on marine megafauna
RISK
LOW
Low levels of noise
Greater than 300 m from a sensitive receiver
Operating within approved hours (7 am to 7 pm Monday to Saturday)
MEDIUM
Less than 300 m from a sensitive receiver
24-hour operation of noisy equipment for less than a week
Noisy equipment is used on site
Duration of campaign is 2–8 weeks
Noise exceeds permitted levels
Complaints received for previous campaigns
HIGH
Less than 300 m from a sensitive receiver
24-hour operation of noisy equipment for over a week
Duration of campaign is over 2 months
Operation within whale migration season or within Adelaide Dolphin Sanctuary
SUGGESTED MANAGEMENT
Complaints register
SUGGESTED MANAGEMENT
Complaints register
Noise management plan
Community notification and consultation
Noise mitigation measures
SUGGESTED MANAGEMENT
Complaints register
Acoustic report
Noise management plan
Marine mammal observer
Noise mitigation measures
Community notification and engagement

DREDGE APPLICANTS OR LICENSEES MUST
1 Not exceed the noise levels as specified in the Noise Policy (refer to information sheets for Construction noise and General environmental noise).
2 Limit noisy activities to between 7 am to 7 pm, Monday to Saturday.
3 Obtain written permission from the EPA or another agency such as a council that administers the *Environment Protection Act 1993* if work is undertaken that generates noise between 7 pm to 7 am Monday to Saturday or on a Sunday or Public Holiday and is likely to impact sensitive receivers.
4 Take reasonable and practicable measures to minimise noise impacts to sensitive land users (eg by selecting quiet equipment, enclosing equipment to reduce noise levels, maintaining equipment, operating noisy equipment at appropriate times).
5 Inform or engage with neighbouring properties of the degree and duration of noise if impacts are likely to occur.
6 Use a complaints register to record and address complaints.

4.4 Air quality (dust, fumes and odour)

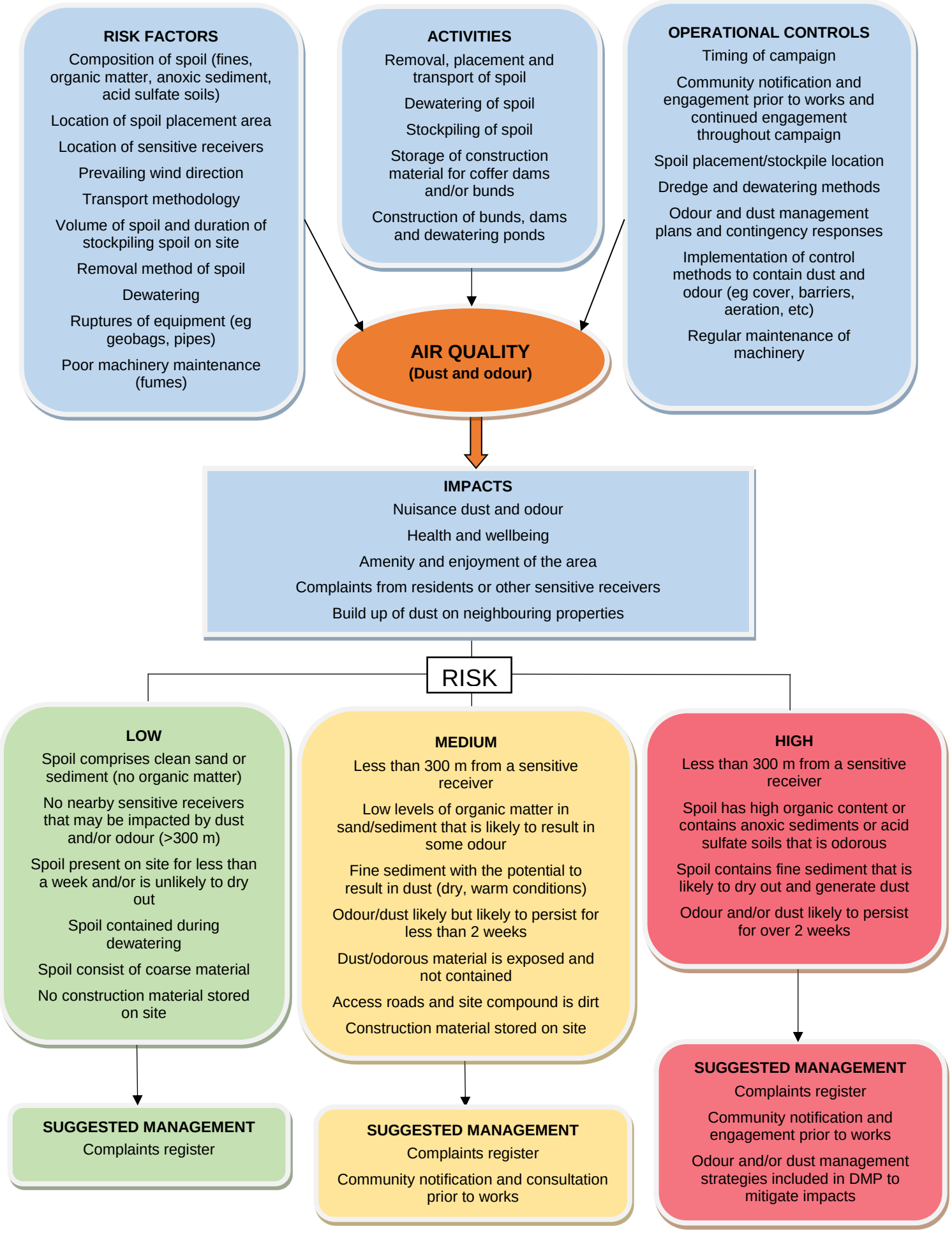
Objective: To protect air quality by minimising odours, dust, combustion and burning related outputs.

Air pollution is defined as the presence of particles and gases in the atmosphere beyond what is considered clean air. This includes dust, odour, and combustion related emissions. Air pollution is regulated via the *Environment Protection (Air Quality) Policy 2016* (Air Quality Policy).

Dredging can release odours that may be offensive and cause nuisance. These can be caused by the disturbance of decomposing organic material such as beach wrack, marine fauna, aquatic vegetation, sediments that are devoid of oxygen or acid sulfate soils. Dredged material that is brought to the surface for disposal or stockpiling on land may release offensive odours over long distances, which can affect the amenity of sensitive land uses. The main effect of environmental odour is nuisance, but stronger or persistent odours can lead to feelings of nausea, headache, loss of sleep and other symptoms of stress.

Dredged material is often very fine and stockpiling or disposing of it to land may also result in the material drying out and becoming raised as dust. Dust can cause a nuisance to sensitive land uses, and if it contains fine particles (PM_{10} and $PM_{2.5}$), there is also a potential human health impact such as asthma, respiratory and heart disease. Larger dust particles are not normally associated with direct health effects, but can cause irritation or nuisance to people by soiling clothes or collecting on surfaces.

The proponent will need to provide information including the proximity of sensitive receivers and distance to any odour and dust producing activities that may result from the dredge campaign (eg removal and stockpiling of spoil). The 300-m evaluation distance specified in the Evaluation distances for effective air quality and noise management for dredging will, under most circumstances, be sufficient to protect sensitive receivers against adverse air quality impacts. If there is a risk of impacts from dust or odour, the proponent will need to demonstrate that the proposed dredging campaign would not have an unacceptable air quality impact on other land uses. This includes demonstrating that criteria in the Air Quality Policy can be met, and providing details of how dredging operations and spoil will be managed to minimise off-site impacts resulting from odour and dust.


RISK FACTORS
Composition of spoil (fines, organic matter, anoxic sediment, acid sulfate soils)
Location of spoil placement area
Location of sensitive receivers
Prevailing wind direction
Transport methodology
Volume of spoil and duration of stockpiling spoil on site
Removal method of spoil
Dewatering
Ruptures of equipment (eg geobags, pipes)
Poor machinery maintenance (fumes)
ACTIVITIES
Removal, placement and transport of spoil
Dewatering of spoil
Stockpiling of spoil
Storage of construction material for coffer dams and/or bunds
Construction of bunds, dams and dewatering ponds
OPERATIONAL CONTROLS
Timing of campaign
Community notification and engagement prior to works and continued engagement throughout campaign
Spoil placement/stockpile location
Dredge and dewatering methods
Odour and dust management plans and contingency responses
Implementation of control methods to contain dust and odour (eg cover, barriers, aeration, etc)
Regular maintenance of machinery
AIR QUALITY
(Dust and odour)
IMPACTS
Nuisance dust and odour
Health and wellbeing
Amenity and enjoyment of the area
Complaints from residents or other sensitive receivers
Build up of dust on neighbouring properties
RISK
LOW
Spoil comprises clean sand or sediment (no organic matter)
No nearby sensitive receivers that may be impacted by dust and/or odour (>300 m)
Spoil present on site for less than a week and/or is unlikely to dry out
Spoil contained during dewatering
Spoil consist of coarse material
No construction material stored on site
MEDIUM
Less than 300 m from a sensitive receiver
Low levels of organic matter in sand/sediment that is likely to result in some odour
Fine sediment with the potential to result in dust (dry, warm conditions)
Odour/dust likely but likely to persist for less than 2 weeks
Dust/odorous material is exposed and not contained
Access roads and site compound is dirt
Construction material stored on site
HIGH
Less than 300 m from a sensitive receiver
Spoil has high organic content or contains anoxic sediments or acid sulfate soils that is odorous
Spoil contains fine sediment that is likely to dry out and generate dust
Odour and/or dust likely to persist for over 2 weeks
SUGGESTED MANAGEMENT
Complaints register
SUGGESTED MANAGEMENT
Complaints register
Community notification and consultation prior to works
SUGGESTED MANAGEMENT
Complaints register
Community notification and engagement prior to works
Odour and/or dust management strategies included in DMP to mitigate impacts

DREDGE APPLICANTS OR LICENCEES MUST
1 Take reasonable and practicable measures to minimise air quality impacts resulting from dust and odour on sensitive receivers. 2 Inform or engage with neighbouring properties of the degree and duration of odour if impacts are likely to occur. 3 Use a complaints register to record and address complaints. 4 Manage dust and fuel emissions from the operation of machinery at the site so it does not affect neighbouring properties or other users of the area. 5 Not unlawfully burn material.

4.5 Waste

Objective: To minimise the impact that solid wastes may have on the environment.

The EP Act describes waste as any discarded, dumped, rejected, abandoned, unwanted or surplus matter whether or not intended for sale or for purification of resource recovery by a separate operation from that which produced the matter whether or not it is of any value. The improper disposal of wastes can cause pollution, particularly contamination of stormwater, surface water, groundwater and land.

The transport and disposal of waste is primarily regulated under the *Environment Protection (Waste to Resources) Policy 2010* (Waste to Resources Policy).

The policy promotes the implementation of the waste management hierarchy which aims to minimise the potential for environmental harm as well as improve resource recovery and reduces waste going to landfill.

Waste that may be produced during dredging operations includes:

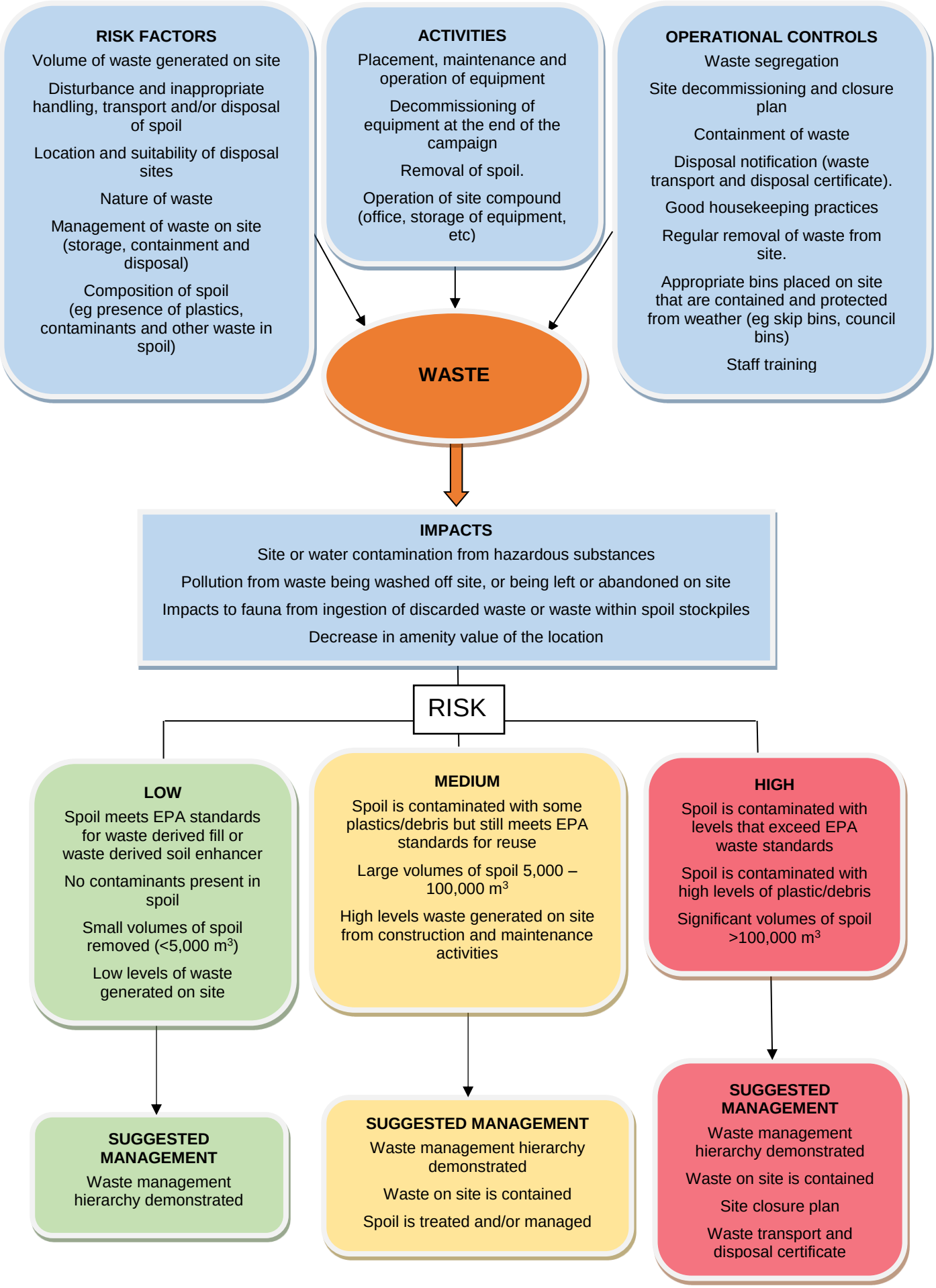
- Site refuse (eg food wrappers, paper, cigarette butts, drink containers);
- Building/construction materials (eg pipes, hoses, metals, bunting);
- Operational equipment (eg oily rags, oil/fuel spill waste, machinery parts, containers, oil, geobags, silt curtains);
- Spoil (eg contaminated sediment, plastics).

Requirements for the management of spoil including potential reuse options are presented in section 2.6.

Further investigation will also need to be undertaken to identify if spoil is contaminated. This may include the presence of acid sulfate soils, plastics, petroleum products, heavy metals, etc. If spoil is assessed as having contaminants, it must be appropriately handled, stored (fully contained), transported (by a licensed waste transporter) and disposed of (to a facility licensed to receive that waste). Any contaminated material that is proposed to be dredged or that is encountered during dredging must be subject to management arrangements that have been approved by the EPA.

If spoil meets relevant chemical and physical criteria and is used and managed in accordance with the Waste derived Soil enhancer standard or Waste derived fill standard (or other relevant standard or specification under clause 4 of the Waste to Resources Policy), it will be no longer considered a waste when reused. Further information for testing spoil is provided in section 8.

If waste is to be stockpiled on site, please refer to Guidelines on the stockpiling of waste. Management of hazardous wastes such as oils, fuels and contaminated spoil is covered in the section 4.6 (Hazardous waste).


RISK FACTORS
Volume of waste generated on site
Disturbance and inappropriate handling, transport and/or disposal of spoil
Location and suitability of disposal sites
Nature of waste
Management of waste on site (storage, containment and disposal)
Composition of spoil (eg presence of plastics, contaminants and other waste in spoil)
ACTIVITIES
Placement, maintenance and operation of equipment
Decommissioning of equipment at the end of the campaign
Removal of spoil.
Operation of site compound (office, storage of equipment, etc)
OPERATIONAL CONTROLS
Waste segregation
Site decommissioning and closure plan
Containment of waste
Disposal notification (waste transport and disposal certificate).
Good housekeeping practices
Regular removal of waste from site.
Appropriate bins placed on site that are contained and protected from weather (eg skip bins, council bins)
Staff training
WASTE
IMPACTS
Site or water contamination from hazardous substances
Pollution from waste being washed off site, or being left or abandoned on site
Impacts to fauna from ingestion of discarded waste or waste within spoil stockpiles
Decrease in amenity value of the location
RISK
LOW
Spoil meets EPA standards for waste derived fill or waste derived soil enhancer
No contaminants present in spoil
Small volumes of spoil removed (<5,000 m3)
Low levels of waste generated on site
MEDIUM
Spoil is contaminated with some plastics/debris but still meets EPA standards for reuse
Large volumes of spoil 5,000 – 100,000 m3
High levels waste generated on site from construction and maintenance activities
HIGH
Spoil is contaminated with levels that exceed EPA waste standards
Spoil is contaminated with high levels of plastic/debris
Significant volumes of spoil >100,000 m3
SUGGESTED MANAGEMENT
Waste management hierarchy demonstrated
SUGGESTED MANAGEMENT
Waste management hierarchy demonstrated
Waste on site is contained
Spoil is treated and/or managed
SUGGESTED MANAGEMENT
Waste management hierarchy demonstrated
Waste on site is contained
Site closure plan
Waste transport and disposal certificate

DREDGE APPLICANTS OR LICENSEES MUST	
1	Apply the waste management hierarchy when identifying options for the management of waste including spoil.
2	Manage and dispose of contaminated spoil as specified in section 4.6 Hazardous substances.
3	Take all reasonable and practicable measures to prevent waste from being blown, washed or swept off site and recover any waste that has been as soon as possible.
4	Store and dispose of waste appropriately. This includes separating hazardous wastes on site and using a landfill that is licensed to take certain types of waste such as oily rags.
5	Demonstrate that wastes have been disposed of appropriately (eg keep records of waste receipts).
6	Not permanently stockpile waste on site.
7	Place/dispose of dredge spoil on land unless it is not practicable to do so or unless placement/disposal to land would have a greater environmental, social or economic impact than disposal to waters.
8	Stockpile and/or deposit dredge spoil in such a way that burial of aquatic or terrestrial flora and fauna is avoided.
9	Identify ways to manage and remove plastics or other contaminants from spoil prior to disposal, stockpiling or reuse.
10	Comply with the Waste derived fill standards or Waste derived soil enhancer standard if spoil is to be reused or recycled.
11	Ensure that all waste and infrastructure is removed once the dredge campaign has been completed.

4.6 Hazardous substances

Objective: To minimise the impact that hazardous (controlled) substances may have on the environment during their use, storage and disposal

The potential for contamination needs to be considered for the dredge and dewatering site and any materials to be used in the construction of bunds, coffer dams, dewatering ponds, etc. Spoil removed from the dredge site will need to be analysed for contaminants prior to dredging. This is to ensure that spoil is managed appropriately to minimise contamination of waters or land. Further information on spoil sediment composition analysis is provided in section 8.

Hazardous waste under the EP Act includes any unwanted or discarded material (excluding radioactive material), which because of its physical, chemical or infectious characteristics can cause significant hazard to human health or the environment. Hazardous substances associated with dredging may include fuels, oils and lubricants used in machinery and contaminants such as metals and plastics that may be present in spoil. Sediments near land-based industrial activities or at ports may contain contaminants such as copper, lead, per- and poly-fluoroalkyl substances (PFAS) or tributyltin.

Contaminants and hazardous materials in sediments can be toxic to aquatic organisms, and remobilised through dredging either as particulates or dissolved in the water column or through transport and stockpiling of material. This could also affect environmental values for recreation and aesthetics, and primary industries – aquaculture and human consumption of aquatic foods when improperly treated, stored, transported, disposed of or otherwise managed.

Acid sulfate soils

Acid sulfate soils (ASS) or potential acid sulfate soils (PASS) may be present at the dredge site. If exposed to air, this can produce acidic conditions which impacts water quality and the environment. Acidity can also dissolve minerals in soil and liberate metals such as aluminium and iron, and nutrients from the sediment.

The potential for exposing ASS needs to be identified through a desktop analysis or sediment quality analysis if needed, at the development approval (DA) stage. The disturbance as a result of dredging may lead to site contamination[8]. Where ASS are identified, consideration should be given to the potential to be detrimental to water quality through dewatering and to the current or proposed use of a site.

Water Quality Australia has produced Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management and dewatering of acid sulfate soils in shallow groundwater environments. Reference to this with regards to the management of ASS or PASS should be provided as part of a dredge management plan.

[8] Acid sulfate soil generation and dredge spoil disposal or storage is a potentially contaminating activity listed activity listed in Schedule 3 of the *Environment Protection Regulations 2009*.

RISK FACTORS

Source of material used to construct bunds, coffer dams, dewatering ponds

Refuelling practices (frequency, bunding, staff error, location)

Presence of contaminants in dredge location within the proposed dredge depth

Presence of contaminants at the dewatering location

Previous use of, or discharges to, the dredge location that may increase potential for contaminants

Presence of acid sulfate soils

Location of site where equipment is washed down (runoff)

Storage and disposal methods of hazardous substances and containers

ACTIVITIES

Removal of spoil

Refuelling and maintenance of vehicles and vessels

Construction of coffer dams and/or bunds

Stockpiling or placement of contaminated spoil on land

Wash-down of equipment.

Dewatering of spoil

OPERATIONAL CONTROLS

Staff training and experience in incident response and refueling operations

Contingency measures such as provisions of appropriate spill kits, bunding, etc

Equipment maintenance checks and cleaning procedures

Development of Incident response and contingency plans

Location of fuel storage and refueling site

Appropriate waste bins used

HAZARDOUS SUBSTANCES

IMPACTS

Site or water contamination

Acidification of waters or soils from acid sulfate soils

Contamination from hazardous waste or contaminated material being washed off site, stockpiled or abandoned

Health of humans and fauna (toxic conditions)

RISK

LOW

Vessel and machinery refuelled on land within bunded area or not refuelled on site

Spoil is not contaminated or contains acid sulfate soils.

Earthen material is not used for construction of bunds etc.

Site is located in a non-industrial area and/or low use area.

SUGGESTED MANAGEMENT

Incident response measures for spills

MEDIUM

Sediment quality analysis shows that some levels of contaminants present however is classified as intermediate

Refuelling is undertaken on land but area is not bunded

Some acid sulfate soils are present on the site

Site is located in a heavily used area (eg marina, frequently used boat ramp)

SUGGESTED MANAGEMENT

Avoidance of acid sulfate soils

Plan for stockpiling and reuse of spoil

Incident response and contingency measures for refuelling including staff training

Spill kits on site

HIGH

Spoil contains contaminants and does not meet EPA standards for reuse

Acid sulfate soils are located on site

Site is located in industrial area (eg Port River)

Refuelling is undertaken over or directly adjacent water

SUGGESTED MANAGEMENT

Spoil disposed at licensed land fill

Supernantant water from dewatering spoil is treated and/or contained

Treatment of acid sulfate soils

Incident response and contingency measures for refuelling including staff training

Spill kits on site

DREDGE APPLICANTS OR LICENSEES MUST
1 Not place contaminated dredge spoil at sea or within inland waters.
2 Ensure all contaminated waste (including contaminated spoil) is stored, handled and transported in ways which do not cause the contamination of land or waters.
3 Design wastewater storage lagoons in accordance with the EPA Guideline: Wastewater lagoon construction if using lagoons to contain contaminated spoil.
4 Ensure that dewatering location or material that is used to construct bunds/coffer dams is not contaminated with hazardous substances.
5 Dispose of contaminated dredge spoil at a facility licensed by the EPA to take such waste.
6 Ensure contaminated and potential acid sulfate soil material are handled, dewatered and disposed of appropriately.
7 Ensure that hazardous substances such as fuels and lubricants are stored, used or disposed of in a lawful manner that does not result in contamination of any land or waters.
8 Ensure that generators, booster pumps, fuel tanks and other similar equipment are located/bunded in a manner that prevents contamination of land, stormwater or the aquatic environment in the event of any spills or leakages (see EPA Guideline: Bunding and spill management).
9 Maintain equipment and infrastructure including pipelines, fuel hoses, bunds, vehicles, vessels, dewatering infrastructure at an appropriate frequency to prevent leakage of spoil, oils, fuels and other hazardous substances.
10 Conduct vessel and vehicle maintenance (including cleaning) within appropriate areas to minimise risk of leaks or cause contamination of any waters (including stormwater) by fuel, oils or other pollutants.
11 Ensure that vehicle and vessel refuelling practices prevent fuel and cleaning water from fuel dispensing being discharged directly or indirectly into any waters. This may include the use of appropriately stocked spill kits, bunding. and staff are trained and experienced in refuelling activities and incident response.
12 Dispose of used oil, oil rags, fuel, batteries or other hazardous waste appropriately via a licensed contractor or with depots licensed by the EPA to receive that waste.

5 Information needed to assess dredging proposals

It is up to the proponent to demonstrate, with evidence, that the dredging campaign can be undertaken in a manner that meets EPA legislative requirements and that all reasonable and practicable measures will be taken to avoid the potential of environmental harm.

5.1 Assessment process

When assessing and regulating dredging campaigns for either development applications, licensing or DMPs, the EPA needs to consider the objects of the EP Act and relevant environment protection policies.

Evidence may include, but is not limited to scientific research, modelling and previous monitoring results (monitoring needs to be scientifically robust). Information provided by the proponent must identify potential environmental impacts posed by the dredging activities and how they can be minimised or mitigated. The EPA expect that all dredge contractors consider best available technology economically achievable (BAT) when planning their dredge campaign and do everything reasonable and practicable to ensure that environmental harm is minimised. This may include but not limited to:

- Designing the capital dredge campaign to minimise the need to undertake maintenance dredging in the future.
- Selecting equipment that is fit for purpose and best suited for the project (considering location and spoil type) to minimise potential environmental impacts.
- Selecting dewatering methods and locations for disposal that minimise impacts to other users of the area, sensitive habitats, water quality and air quality.
- Undertaking dredging at appropriate times of the year to minimise impacts to the environment.
- Using modelling or already acquired data to identify the fate and extent of turbidity plumes generated during dredging, and spoil dewatering and placement.
- Using sediment retention techniques and water quality monitoring to manage and control sediment dispersion and turbidity.
- Using equipment to record real-time data to support the environmental management of the dredge campaign.
- Adaptive management options identified/recorded to ensure appropriate response to issues identified through real-time data collection and ongoing monitoring including contingency options, incident response arrangements, etc.

It is recommended that proponents of dredging contact the EPA in the early stages of planning so that requirements can be discussed. The EPA also advises how the environmental impacts of a dredging proposal will be assessed, particularly for high risk projects which may require baseline data or community consultation. This will reduce the likelihood of unexpected delays and allow for effective planning and staging of the project. Further information on the EPA's expectations is provided in section 4.

For routine maintenance dredging, it is recognised that much of the information may have been collected during the assessment of previous dredging campaigns. Depending on the age of the information and the nature of the dredge campaign, the licence and/or DMP assessment process for maintenance dredging may be simplified. This is outlined in section 6.2.

5.2 Assessment timeframes

An EPA assessment of a dredge proposal will generally be required for a development application referral, licence application and dredge management plan. The time needed by the EPA to assess a dredge proposal will depend on a number of factors which include:

- Scale of the campaign i.e. volume of spoil to be removed and duration;
- Proximity to aquatic plants and animals and other sensitive habitats or receivers;
- EPA requests for further information;
- Environmental risk associated with the dredge campaign;
- Whether the DA was referred to the EPA for assessment;
- Compliance history and monitoring results;
- Maintenance or capital dredging;
- Likelihood of complaints.

In general, the EPA assessment timeframes[9] for the DA, Licence application and DMP are as follows:

Assessment stage	Purpose	Timeframe for EPA assessment
Development application[10]	• Assesses the overall scope of the project with respect to location and construction. • Assessed by other government departments as referred by the planning authority. • Sets conditions of approval relating to the construction of the proposed dredge activity.	• 30 business days (PDI Act) • EPA must request further information (FIR) within 10 days of receiving the application from the planning authority. Applicant has 5 days to submit response to FIR (can be extended by the applicant). EPA grants an automatic one month extension if response to FIR is not received within 5 days. • EPA can submit FIR multiple times.
Licence application	• Assesses and regulates the operation of the dredge campaign. • Provides authorisation and conditions to ensure compliance with the EP Act and relevant EPPs. • Determines suitability of applicant as a fit and proper person to hold an environmental authorisation. • Ensure the application aligns with the proposal submitted for the DA (if applicable). • Verifies compliance with other approvals	• 2 months. Can be extended up to but not exceeding 4 months (EP Act). • Licence assessment period includes public notification of 2 weeks. • Up to 2 weeks for low risk, 3 – 4 weeks for medium risk and 6 – 8 weeks for a high risk dredge campaign. This does not take into account any FIRs from the EPA.

[9] The assessment timeframes only reflect EPA's role in this process. It does not reflect the time required for the planning authority and other government agencies to assess and approve applications.

[10] Current timeframes are specified in the *Planning Development and Infrastructure Act 2016* (PDI Act) which comes into full operation in 2021. For DAs still assessed under the *Development Act 1993* (predominantly inland), the timeframe is 6 weeks for assessment of DA referrals and 5 days for the EPA to submit a FIR after receiving the referral.

Assessment stage	Purpose	Timeframe for EPA assessment
Dredge Management Plan	• Assesses how the dredge campaign will be managed to prevent or reduce risks to the environment. • Confirms the scope, methodology, environmental management, contingency and incident response arrangements for the campaign. • Can be submitted with the licence application but will not be endorsed until the licence has been issued.	• Up to 20 days required for EPA to assess a DMP. • Will depend on whether a DA has been referred to the EPA for assessment and whether a DMP was submitted and assessed as part of the licence application. • Long term routine maintenance dredging, refer to section 6.2.

5.3 Information checklist

The following checklist provides guidance on the level of information required by the EPA to undertake an assessment of the dredge proposal. For higher-risk proposals, more detailed information may be required.

The checklist is divided into five parts:

- **Applies to** – what activities associated with the dredge campaign will be considered in EPA's assessment.
- **Assessment criteria** – EPA's expectations on what the information provided by the applicant needs to demonstrate.
- **Resources** – web-based material that can be used to help inform and guide applicants.
- **Minimum information required** – for the EPA to undertake a risk assessment of the environmental impacts associated with a proposed dredge campaign. Evidence will need to be provided to support your response.
- **Additional information required if** – further information may be required under specified circumstances.

☐* denotes information required at the development application stage if it is referred to the EPA for an assessment. If known, all information can be provided at the DA stage as this may speed up the assessment of the licence and DMP.

The majority of this information will be required by the EPA during the assessment of the DA for the proposed dredge campaign, or if a DA is not required, in the DMP. Although a DMP is not officially required for a DA, to avoid duplication, the applicant is encouraged to lodge the information for a DA in the format of draft DMP. This DMP will then be finalised during the assessment and issuing of an EPA licence. A suggested structure for a DMP has been provided in section 6.

Variations between information provided for the DA and DMP are acceptable provided the demonstrated environmental outcomes are the same or better and are consistent with the conditions of approval for other agencies including development approval. If this occurs, the EPA may require further information and an extended time to assess these changes and approve the DMP. It should be also noted that changes to dredge footprint, dewatering or disposal locations may require a variation to the DA.

5.3.1 General information

Applies to	• Deployment, installation, and decommissioning/removal of dredge equipment including machinery, silt curtains, geobags, pipes, pumps, etc. • Construction of bunds, coffer dams, dewatering ponds, etc. • Operation of dredge and other associated vessels and equipment such as booster pumps. • Spoil management, placement and/or disposal and removal which considers the composition of the spoil.

	• Washdown and maintenance of equipment and machinery. • Refuelling of plant and equipment. • Storage, handling, disposal and spill response of chemicals and fuels. • Movement of equipment including trucks (drag-out).
Assessment criteria	• The need for future maintenance dredging has been considered. • All reasonable and practicable measures are undertaken to minimise or prevent the potential for environmental harm that may result from dredging and the management and disposal of spoil. • Best available technology economically qchievable (BAT) is used when planning a dredge campaign. • Social and economic implications are considered.
Resources	• Nature Maps • Enviro Data SA • Location maps (tide locations, industry, water courses, stormwater drains, etc.) • National Pollution Inventory (data on pollutant emissions) • Reef life survey data

Minimum information required – Overall scope of dredging	**Provided**
Provide aerial photographs and a scaled map of the dredge and spoil placement site and surrounds which shows: • location and area to be dredged and location where spoil is to be stockpiled, dewatered and/or disposed; • supporting structures; • on-land storage locations including infrastructure, fuel storage and refuelling locations; • vehicle or vessel entry, exit and manoeuvring areas; • spoil placement, disposal or dewatering area; • approximate location of mean high/low water mark (marine) or watercourse (inland); • bathymetry/land contours; • stockpiles of waste; • location of sensitive receivers including residents, businesses, public facilities (eg housing, schools playgrounds, hospitals, sporting facilities, jetties, aquaculture, commerical fishing grounds), etc[11]; • location and nature of sensitive vegetation (eg mangroves, seagrass, reefs, reeds), watercourses (including lakes, rivers, streams, estuaries, wetlands, dams, channels), or marine waters located within 500 m of the sites[12] that will be used for the dredge campaign (dredging, dewatering, storage and/or disposal of spoil). Include methodology and data sources for the collection of this information;	☐*

[11] For further information refer to the *Evaluation distances for effective air quality and noise management*, *Interface between land uses* position statement, *Air quality and the South Australian Planning System* position statement, and *Noise and the South Australian planning system* position statement.

[12] May be greater than 500 m for high risk dredge campaigns where potential impacts are likely to extend beyond this distance.

• location of marine reserves, sensitive habitats and protected areas such as marine parks, national parks, conservation areas, watershed protection areas, fish habitat areas, salt marshes, dunes, bird and mammal colonies, cultural areas, shipwrecks etc; • method of drainage and direction of stormwater flow passing over or leaving the site, all stormwater discharge points and any proposed stormwater infrastructure; • approximate north point.	
What is the purpose of the dredging (eg construction of boat ramp, laying of pipe, improve water flows, etc)?	☐*
Is the application for capital dredging (site has never been dredged) or maintenance dredging (site has previously been dredged)?	☐*
Have alternative options been considered (eg sites with deeper waters, use of other already established shipping channels, other locations) and if so, why were these disregarded?	☐*
What is the economic and social impact if dredging does not occur?	☐*
What is the likelihood that the dredged area will require maintenance dredging? If so, how often? Have you considered ways to reduce frequency of maintenance dredging? What is the evidence to support your response?	☐
What are the environmental values at the dredge site and location where the spoil will be treated, placed, disposed (eg ecological, recreational, conservation, etc)?	☐*
What dredge equipment and infrastructure will be used and why have they been selected and considered best practice for the required dredging campaign? This includes but not limited to: • the type of dredge; • support equipment such as barges, trucks, fuel storage, pumps; • structures including pipes, dewatering infrastructure (geobags, ponds, coffer dams, silt curtains, etc).	☐*
Describe how the equipment and/or structures will be deployed on site and removed once the campaign has been completed.	☐
When do you propose to dredge and how long will the dredging go for (from establishment of equipment to decommissioning of site)? Are there any critical timeframes for the commencement or completion of the campaign the EPA needs to be aware of and if so what are they and why?	☐*
What are the proposed operating hours/days and what is the proposed timing for the works (time of year and length of campaign)? Are there any impacts that need to be considered with respect to the time when the dredging needs to be undertaken (eg recreational users, breeding or migratory periods of birds/animals, spawning, recruitment or growth periods of plants or animals) – if so what are they and how have these been addressed?	☐*
How will access to the dredging site and spoil placement site be achieved, eg installation of platforms, traffic movement across beaches, etc? How will this be undertaken in a manner that minimises impact to the surrounding environment (both aquatic and terrestrial)?	☐*

How large and deep is the dredge footprint and what is the maximum volume of spoil that needs to be removed? Will there be any circumstances that may alter the predicted volume of spoil to be removed and if so what are they and how will this be managed?	☐*
What is the composition and nature of the spoil (assessed from samples taken to the proposed dredge extent and depth) that is to be removed from the dredge site, eg sediment size (percentage of clay/silts), organic matter including beach wrack and live seagrass, contaminants including hazardous substances and plastics, acid sulfate soils? How has this influenced the selection of dredging methods and equipment? Further guidance on this is presented in section 8.	☐*
How will removed spoil will be managed (consider the waste management hierarchy) with respect to: • contamination (metals, acid sulfate soils, toxicants) and/or other materials (plastics) if applicable; • transportation to dewatering site or disposal location; • dewatering (if applicable) and methods for the reduction of fines prior to discharge; • location of disposal/stockpile/placement site on land or in waters and how sand drift will be minimised if applicable; • storage times and footprint (width and height) for stockpiles of spoil on the site; • end fate of material (eg used for construction element of project and beach replenishment, reuse, disposed to waste facility and at sea) and the application of the waste management hierarchy in determining this. How has the composition of spoil been considered in determining the appropriate methodologies for the above?	☐*
What is the general description of the dredge site and surrounding area, and the location where spoil is to be placed, dewatered or disposed, eg ecological habitat (flora and fauna), bathymetry, land contours, watercourses. Are there any areas of significance that may be impacted (eg areas of cultural significance, national, conservation or marine park, protected area, shipwrecks), waters, stormwater, etc. A habitat map would be useful.	☐*
Is the dredge area and spoil placement site frequented by significant fauna (eg birds, whales, dolphins, reptiles, etc) and if so, what are they and at what frequency?	☐*
What is the nature of the site where vehicle movement will be undertaken (dirt, cement, etc)? How frequent will vehicle movement be if there is the potential for dust impacts or drag-out?	☐
Provide verification of other approvals including Development Approval. If a DA was not required, evidence will need to be provided to the EPA (eg letter from the relevant planning authority)?	☐

5.3.2 Water quality

Applies to	• Placement and/or construction of infrastructure such as bunds, silt curtains, coffer dams, dredge, working platforms, hardstand areas. • Removal of spoil during dredging (mobilisation of sediment and overflow of water). • Dewatering of spoil and discharge of fines into waters. • Placement of spoil in waters or on land adjacent waters. • Transport of spoil into containment structures (eg ponds, geobags).
Assessment criteria	• All reasonable and practicable measures are implemented to minimise impacts to water quality and sensitive habitats.

	• Composition of spoil is known (contaminants and sediment characteristics). • Appropriate dredge equipment and timeframes are selected to minimise impacts on water quality and the aquatic environment. • Turbidity plumes are minimised and will not impact sensitive habitats. • Recreational (eg swimming), commercial and recreational fishing, and aquaculture values are not compromised. • Compliance with NAGD if marine disposal of spoil is proposed. • Supernatant water is treated in a manner to minimise impacts to the receiving environment (water quality, flora and fauna). • Waste management hierarchy has been considered for the management and discharge of wastewater from dewatering of spoil. • Water quality monitoring will identify and manage impacts (see section 7). • Impacts from spills and leaks from infrastructure and equipment (eg pipelines, fuel hoses, bunds, dredge machinery, dewatering infrastructure) are prevented.
Resources	• WAMSI Characterisation of dredge plumes • WAMSI Dredging science node reports • WaterConnect • National Water Quality Guidelines • National assessment guidelines for dredging NAGD • EPA Position Statement: Water quality and the SA Planning System • Best practice erosion and sediment control

Minimum information required – Water quality	**Provided**
What is the predicted duration of dredging (actual removal of spoil)?	☐*
Identify any potential water quality impacts that may occur when dredging is undertaken and describe how these will be managed.	☐*
What is the ambient water quality (oxygen, turbidity, pH) of the dredge area and spoil placement site where dewatering or disposal will occur relevant to the time of year for the dredge campaign?	☐
What is the distance to and composition of vegetation and/or aquatic flora/reef present at and adjacent the dredge site and spoil placement site where impacts may occur?	☐*
For inland waters, is the watercourse permanent or ephemeral? • If the stream is ephemeral, at what frequency is water present in the stream ie what is the likelihood of water being naturally present in the watercourse when dredging needs to occur. • What is the flow rate of the waters? • Can the dredging be undertaken when naturally dry or be made dry if water is present? • How will water flow be managed in the event that rain is forecasted during the campaign?	☐

For marine waters, what is the wave energy, tides and current flows present at the dredge site and spoil placement? Specify where this information sourced from.	☐
How will potential turbidity plumes that may result from dredging and any associated activity (eg installation of bunds, silt curtains, ponds) be managed, monitored and minimised? • Are there any natural barriers to minimise the spread of turbidity? • Are there any circumstances which may prevent the use of the selected equipment (eg sediment composition, weather conditions, etc)? • Provide evidence for the effectiveness of the proposed mitigation measures in relation to the nature of the dredge site.	☐*

Additional information required if ...		**Provided**
Spoil contains a portion of fine sediments (~ more than 1% clays/silts) AND/OR Dredge spoil volume is greater than 100,000 m^3 and duration of dredge campaign is greater than 8 weeks.	Provide hydrodynamic modelling and sediment deposition modelling to predict the fate and degree of turbidity plumes that may occur at any locations where water quality may be impacted at the dredge, dewatering or disposal site. Modelling must consider local conditions and 'worst case scenarios' including the potential for resuspension of sediments and maximum dredge volumes.	☐*
Sensitive habitat is located or potentially within the turbidity plume that may result from dredging and/or dewatering of spoil AND/OR Organic matter is present in spoil.	What monitoring will be undertaken to demonstrate there are no impacts to the flora and fauna which may result from poor water quality (eg turbidity, low oxygen) from dredging and/or dewatering? What will the ALARM and HOLD triggers be? For further guidance on developing a water quality monitoring program, please refer to section 7.	☐
Area is used by swimmers and other recreational users OR Complaints have occurred or are likely to occur due to poor water quality.	How will the community be consulted and how will complaints be managed?	☐
Supernatant/overflow water from dewatering of spoil is discharged directly or indirectly into the aquatic environment (marine or inland).	What are the potential volumes, flow rates, and duration for dewatering/overflow? How will supernatant or overflow water be treated to reduce turbidity prior to discharge (eg function of sediment ponds, filtration, swales, hoppers, use of flocculants, use of excavators at discharge point)? Where will supernatant water be discharged to? How will spillages and breakages from dewatering infrastructure be managed (eg bunds, geobags)? What is the composition and nature of the discharge water (eg nutrient load, fine clay particles, discolouration)?	☐*

	What monitoring will be undertaken to ensure that discharged water does not exceed triggers? Refer to section 7 for further guidance on monitoring.	
Fill material is being used to construct bunds, hardstand areas, working platforms	What is the volume and composition (including sediment size) of fill that will be used and where is it sourced from? Does the fill meet the EPA Waste Derived Fill standard? How will it be managed to ensure it does not result in impacts to quality of any waters (surface waters and stormwater)? How will the fill be removed once dredging has been completed?	☐
For landbased sites (dredge and/or dewatering site) – the potential for flooding or high rainfall (greater than 10 mm over a 24-hour period) during the dredge campaign	How will stormwater runoff at the spoil placement location or dredge area (inland), be managed to prevent sediment being transported into any waters in the event of high rainfall (contingencies?).	☐
Marine – spoil is placed at sea (offshore or nearshore)	How will spoil placement meet the requirements of the NAGD eg: • Have alternative locations been investigated? Why were they disregarded? • What is the benthic composition at and directly adjacent the placement site that could be impacted by smothering or turbidity plumes? • What are the potential impacts and how will these be monitored and mitigated? This may include hydrodynamic modelling.	☐
The dredge site or spoil placement site is located within 1 km of an aquaculture facility (either land-based pump-ashore or marine farms) Aquaculture Public Register or shellfish harvesting area SA Shellfish Quality Assurance Program (SASQAP).	Identify potential impacts to the aquaculture facility or growing areas and how these can be managed.	☐

5.3.3 Noise

Applies to	• Movement of all vessels and vehicles used during the campaign. • Use of dredge and dewatering equipment. • Pumps and generators. • Anchoring.
Assessment criteria	• Noise does not cause nuisance to neighbouring properties and meets the legislated noise levels and timeframes. • Complaints from the community will be appropriately addressed. • Minimal impact to marine megafauna.
Resources	• EPA Guideline: Construction noise

	• EPA Guideline: Noise • EPA Position Statement: Noise and the Planning System • EPA Guideline: Evaluation distances for effective air quality and noise management • DPTI underwater noise guidelines • DPTI Management of Noise and Vibration: Construction and Maintenance Activities

Minimum information required – Noise	Provided
What noisy equipment will be used on the proposed sites during the dredge campaign and where will the equipment be placed in relation to the sensitive receivers (these can include residents, schools, business, recreational facilities, etc)?	☐*
What are the operating times of the noisy equipment and how long will noisy equipment be used for throughout the dredge campaign?	☐*
Is the site known to be frequented by marine megafauna (eg dolphins, whales, etc)? If so how often? Can the timing of the dredge campaign be changed to avoid impacts?	☐

Further information required if …		Provided
Noise is likely to be heard by sensitive receivers (less than 300 m away) but duration of noise is less than 2 weeks	How will complaints be dealt with?	☐*
Noise is likely to be heard by sensitive receivers (less than 300 m) however: Noisy equipment use is not continuous AND/OR Duration of the dredge campaign is greater than 2 weeks.	What mitigation measures are being used on site to minimise the impacts of noise to sensitive receivers (eg insulating noisy equipment, operating hours, etc) Describe how you will consult with sensitive receivers that may be potentially impacted? How will any complaints be resolved?	☐*
Noisy equipment is operating almost continuously over a 24-hour period for over a week and can be heard by sensitive receivers (less than 300 m).	Provide justification why the works need to occur over a 24-hour period. Provide an acoustic report to identify the level of noise impacts to sensitive receivers that are located in close proximity to the sources of noise. What mitigation measures are being used on site to minimise the impacts of noise to sensitive receivers (eg insulating noisy equipment, operating hours, etc)? Describe how you will consult with sensitive receivers that may be potentially impacted? How will any complaints be resolved?	☐*
Dredge area is frequently visited by recreational users who may be impacted by noised (amenity value).	How will recreation users be advised of adverse noise that will be experienced during dredging?	☐
Dredge campaign is undertaken in an area frequently visited by marine megafauna or	Describe what mitigation measures will be undertaken to avoid noise impacts on marine megafauna (eg marine mammal observer, timing of dredging activities, etc).	☐*

will occur within the whale migration season or within the Adelaide Dolphin Sanctuary		

5.3.4 Air quality (dust, fumes and odour)

Applies to	• Storage of construction material for coffer dams, dewatering ponds and bunds. • Removal, transport and stockpiling/storage of spoil (fine sediments, organic matter, acid sulfate soils). • Construction of coffer dams, dewatering ponds and bunds. • Dewatering of spoil. • Movement of site-based vehicles and equipment.
Assessment criteria	• Potential dust or odour emissions meets the appropriate criteria. • Dust, odour or fumes does not cause nuisance or impacts to human health. • Complaints from the community will be appropriately addressed.
Resources	• EPA Position Statement: Air quality and the SA Planning System • EPA Guideline: Evaluation distances for effective air quality and noise management • EPA Guideline: Ambient air quality assessment

Minimum information required – Air quality	**Provided**
What are the potential sources of dust (eg stockpiles of spoil, vehicle movement, materials used to construct bunds/coffer dams) or odour (eg beach wrack, acid sulfate soils, anoxic soils) on site? What is the distance between these sources and sensitive receivers?	☐*
How long will potential sources of odour be present for?	☐*

Further information required if …		**Provided**
Sensitive receivers located within 300 m of materials that may generate dust or odour. AND/OR Area where dust or odour may be present is used by recreational visitors (eg fishers, playgrounds, beach goers, etc).	What is the prevailing wind direction (this will indicate where dust or odour plumes are likely to travel)? How will complaints be monitored, managed and resolved?	☐*
Spoil contains organic matter, sulfate soils or is anoxic and is likely to generate odour.	Where will odorous materials be placed on site and what is the distance between these materials and sensitive receivers? How will spoil comprising of odorous material be transported and disposed and how will spillages or ruptures (eg from pipes, geobags) be prevented or contained if they occur?	☐*
Potential for odour and or dust likely to be present for over a week.	How will community be consulted/engaged regarding dust and odour, and what information will be provided during this process?	☐*

	How will dust and/or odour events be monitored and/or mitigated? What are the contingencies if dust and/or odour events on site become significant? Have other options been considered to minimise the potential for dust and/or odour? If so, what are these and why were they not adopted?	

5.3.5 Waste

Applies to	• Placement and/or construction of infrastructure and decommissioning of any sites associated with the dredging activity (dredge location, location of spoil placement, storage of infrastructure, etc) which generates waste such as plastics, building materials, storage containers, etc). • Storage and disposal of any waste that is generated as part of the dredge campaign. • Management of spoil. • Spoil treatment and or disposal if spoil is contaminated.
Assessment criteria	• Waste management hierarchy is applied. • Waste is handled, transported, stored and/or disposed in a manner that does not cause contamination of land or waters that may result from spillage or leakage. • Waste is segregated, managed, transported and disposed of appropriately depending on the type of waste, eg to a licensed waste facility, council kerbside collection, recycling facility. • A licensed waste transporter is used if the material to be disposed includes a listed waste. • Wastes are appropriately stockpiled on site.
Resources	• EPA Standard for the production and use of waste derived fill • Guideline for stockpile management: Waste and waste derived products for recycling and reuse • Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil

Minimum information required – Waste	**Provided**
What is the nature and volumes of wastes (other than spoil) that are likely to be generated at the sites?	☐*
How and where will the different waste types generated on site will be stored, stockpiled and/or disposed including how the management hierarchy has been applied?	☐*
If spoil is to be reused, does it meet EPA standards for Waste derived fill or Waste derived soil enhancer? Provide evidence.	☐
Demonstrate how waste (including waste spoil) will be disposed of appropriately (eg closure plan, waste transport/disposal certificate)?	☐*

Further information required if (waste)…		Provided
Spoil is contaminated with significant levels of waste materials (plastics, rubbish, etc).	What are the management arrangements to prevent contamination of land or waters during dredging/storage/dewatering/stockpiling of spoil? How will wastes present in the spoil be managed, extracted and disposed of?	☐*
Spoil does not meet the WDF standard.	How will spoil be disposed of (includes transport, treatment and final disposal location)	☐
Waste storage area is located near the aquatic environment or stormwater system.	How will waste be stored to prevent it from entering these waters?	☐
Location where waste will be stored is regularly used by recreational users, eg jetties, boat ramps, etc and commercial industry (eg Port River, large marinas).	Describe how waste will be managed to minimise the impact to users.	☐

5.3.6 Hazardous substances

Applies to	• Equipment maintenance including refuelling, use of hydrocarbons, chemicals, lubricants, etc. • Washdown of equipment. • Construction of coffer dams and/or bunds. • Removal and placement of contaminated spoil during dredging and dewatering.
Assessment criteria	• No spillages of contaminants or spillages can be contained. This includes the use of fuels. • Land and waters do not become toxic to aquatic or terrestrial organisms. • Acid sulfate soils and potential acid sulfates are not disturbed or managed appropriately during dredging, dewatering and placement of spoil. See http://www.waterquality.gov.au/issues/acid-sulfate-soils • Hazardous substances (such as fuel) and contaminated material are handled, used, stored, transported and disposed to ensure no environmental harm or spread of contaminants to land or waters.
Reference Material	• National Assessment Guidelines for Dredging • Current criteria for the classification of waste • Standard for the production and use of waste derived fill • Water Quality Australia – acid sulfate soils • The University of Adelaide: The acid sulfate soils centre • EPA Guideline: Site contamination - acid sulfate soil materials • EPA Guideline: Bunding and spill management • EPA Guideline: Wastewater lagoon construction (for contaminated spoil) • DPTI Guideline for the assessment of acid sulfate soils

Minimum information required – Hazardous substances	Provided
What is the potential for spoil or substrate to be used for construction of coffer dams, dewatering ponds or bunds to be contaminated with hazardous substances including heavy metals, petroleum products, pathogens (eg *e-coli*) and acid sulfate soils based on previous history, current nature and use of dredging site, desktop analysis, mapping and/or observations?	☐
What is the potential for the dredge site and dewatering location to be contaminated? Consider: • current and historical use of site (eg boat launching, marina, industrial use, residential, discharges); • stormwater runoff; • agricultural runoff.	☐*
Has there been any historical spills of hazardous substances at the location? If so, what was the nature and extent of these spills?	☐
Where will fuel, lubricants and other hazardous substances be stored on site? What are the volumes of fuels that will be stored on site? How will potential spillages or leaks be contained?	☐
Where will equipment maintenance (including oil changes, wash-down areas) and refuelling take place? How often will this need to occur? How will spills or leakages be contained?	☐

Further information required if …		Provided
High potential for hazardous substances to be present in spoil or dewatering location or bund/coffer dam material based on information collected in Level 1 (eg site is an industrial port, historical evidence of spills, mapping shows presence of acid sulfate soils).	Undertake analysis of sediments for the presence of contaminants in: • dredge location AND/OR • dewatering location AND/OR • material that will be used to construct bund/coffer dams.	☐*
Sediment analysis of dredge or dewatering site shows contamination (eg metals, acid sulfate soils, fuels, PFAS, etc).	How will contaminated spoil be managed with respect to stockpiling, disposal, dewatering, leakage, etc in a manner to prevent contamination of land or waters (including surface, groundwater and stormwater), such as bunding?	☐*
Acid sulfate soils is present at the dredge site or dewatering site.	How will the disturbance of acid sulfate soils be managed and minimised during the dredging process and spoil placement? Can disturbance be avoided altogether. If not why? How will acid sulfate soils be disposed of or neutralised?	☐*
Refuelling and equipment maintenance is undertaken on land however, spillages of fuels, lubricants, etc has the potential to reach waters (this includes surface waters, groundwater and stormwater) based on their location and slope of the land.	Describe how leakages of fuel and or lubricants will be prevented and contained on land (eg bunding, spill kits, etc).	☐
Refuelling takes place over waters (eg in the marine environment).	How will potential spills during refuelling be prevented and in the event of a spill, how will it be contained (eg marine	☐

	spill kits that contain appropriate materials (including booms) to contain and clean hydrocarbon spills, drip containers, staff training, etc)? Are the proposed arrangements appropriate for the location of the refuelling site and volume of fuels that will be used?	
Flocculants used during dewatering.	How will flocculants be stored and contained? Is the flocculant MSDS suitable for use in sensitive aquatic environments? Provide evidence. What is its ecological toxicity levels and how will this be managed? The MSDS must state the product is non-toxic to aquatic organisms and does not accumulate in the environment. How will the settled sediment post flocculation be managed and disposed of?	☐

5.4 Schedule of Works

The licensee must submit a notification of intent and schedule of works (Table 3) to the EPA at least 5 business days prior to the commencement of any dredging activities. This is to ensure that EPA is aware of when the dredge campaign will be undertaken and to plan for any site visits if necessary.

Table 3 Template for schedule of works

ACTIVITY	DATES (commencement – completion)
Mobilisation of equipment and vessels to the dredge site	
Construction of any infrastructure associated with the campaign (e.g. dewatering, bunds, coffer dams etc.)	
Dredging works	
Removal of dredge equipment from dredge site.	
Decommissioning of infrastructure from site including removing of bunding, dewatering structures, coffer dams etc.	
Removal / Transport / Disposal of spoil from site.	
List any other activities that may be associated with the dredge campaign	

6 Developing a dredge management plan

A DMP for each dredge campaign (including those conducted under a various locations licence) must be developed by a suitably qualified person and submitted and approved by the EPA prior to the commencement of any works associated with the campaign.

A dredge management plan (DMP) needs to contain sufficient information for the EPA to be confident that potential impacts on the environment, and public health and amenity have been identified, and suitable measures to mitigate those impacts will be applied during the dredge campaign. Much of the information requirements for DMPs are specified in section 5. A DMP is not necessary for a development application however the proponent is encouraged to include their DMP within the application if possible as this is likely reduce the time needed for the EPA to assess the application at the licensing stage.

A DMP is developed and implemented to ensure dredging is managed in a way that prevents or reduces risks to the environment. The DMP must be prepared by a suitably qualified person and implemented by the licensee and must confirm the scope, methodology, potential impacts, environmental management, contingency and incident response arrangements for the project. It is up to the licensee to decide how they wish to present their DMP however it must include all the necessary information.

The following template has been provided for maintenance dredge campaigns and low-to-medium risk campaigns. A more detailed DMP may be required for higher-risk campaigns. It is highly recommended the proponents contact the EPA for advice when drafting a DMP, particularly in relation to the development of monitoring programs.

Once a DMP has been developed to the satisfaction of the EPA, submissions of subsequent DMPs for maintenance dredge campaigns may be simplified depending on the scope and risk associated with these campaigns.

Note: This section only references information relevant to EPA legislation which is based on environmental harm as a result of depositing or discharging a pollutant. The licensee/contractor may wish to include other aspects within their DMP such as biosecurity impacts, native vegetation clearing, physical disturbance to marine megafauna, however these will not be assessed by the EPA. It will be up to the licensee/contractor discuss their risk analysis and management strategies documented within their DMP with the relevant agencies to determine if they meet their legislative requirements. Refer to Table 1 for guidance on environmental legislation administered by other agencies that may apply to dredging activities.

6.1 DMP template

Administration

1 Development Approval number (copy of DA should be attached to DMP as an appendix) or a letter from planning authority/client stating that DA is not required.

2 Client name eg council, Department of Planning, Transport and Infrastructure, SA Water.

3 EPA Licensee name and number.

4 Contact details of site supervisor/environment manager who can be contacted throughout the duration of the works.

5 Details of other permits and approvals that have been obtained or in the process of acquiring. For example, DEW for works in Marine Parks, Native Vegetation Council for removal of seagrass and other native vegetation, DIT for works on Crown Land and the seabed, DEW for works on Crown Land, Landscape SA for Water affecting activity permit.

Dredging campaign overview

Provide direct information about the dredge campaign

1 Why is dredging needed?

2 What is the volume of spoil to be removed?

3 What are the environmental values of the dredging and spoil placement location eg ecological (including conservation, marine and national parks, sanctuaries, etc), recreational, agricultural?

4 Include a satellite map showing the approved dredge footprint (both area and depth profile).

5 Provide a site map to scale showing:
- the dredge location
- areas used for the storage and maintenance of equipment and placement of spoil;
- location of fuel and chemical storage and refuelling area;
- location of sensitive receivers (eg residents, playgrounds, sport clubs, schools etc.)
- habitat mapping
- current uses (industrial, marinas, conservation parks, marine parks, fishing, aquaculture, etc)
- location of waters (marine and inland) and location of nearest sensitive habitats eg seagrass beds, mangroves, reef, aquatic vegetation, fauna nesting sites
- potential pollution sources (eg stormwater drains, discharges from other industries, etc).

6 Provide a description of the environmental conditions where dredging and spoil placement/disposal is to occur (eg current flow, flow rates, winds, waves, tides, temperature, turbidity, ecology etc).

7 What dredge equipment will be used for the campaign and for what purpose?

8 What is the composition of spoil (eg sediments, contaminants, etc) that is to be removed from the dredge site (sediment analysis)?

9 Describe how removed spoil is to be managed (eg transport, dewatering, placement, disposal).

10 What is the schedule of works for the dredge campaign (timeline of the dredging and dewatering campaign)?

11 What are the normal hours of operation during the dredge campaign?

Impact analysis and risk management

Describe the key environmental risks associated with the dredge campaign (including deployment of equipment and structures, management of spoil (removal, transport, placement, disposal), operation and maintenance of equipment and decommission of site, and how risks will be managed.

Refer to section 4 on potential impacts and EPA expectations, and section 5 for guidance on the level of information required and section 7 for environmental monitoring requirements.

This can be separated into sub-tables for different activities/aspects if needed, for example:

- Water quality – Removal of spoil from dredge location, Placement of spoil, discharge of supernatant water, Turbidity (example below), Dissolved oxygen ,etc.
- Noise – Underwater noise, noise from machinery, etc.
- Air quality – Dust, odour, etc.
- Waste – Hazardous waste (including contaminated spoil, acid sulfate soils), general waste, spoil disposal, etc.
- Hazardous substances – refuelling, maintenance of vehicles and vessels, etc.

Applicability	Identify the activities undertaken during the dredge campaign that may cause this impact. *eg Turbidity .* • *Removal of dredge spoil at the dredge site.* • *Discharge of supernatant water from the dewatering site.*
Potential Impacts	Describe the impacts that may occur as a result of the activities *eg Turbidity* • *Smothering of aquatic vegetation located within 400m of the dredge site may occur.* • *Reduced light available for aquatic vegetation if plumes do reach the vegetation.* • *Vegetation loss associated with smothering and reduced light.*
Desired outcomes	What are the expected environmental outcomes? What are the performance measures which demonstrate these outcomes have been achieved? *eg Turbidity* • *Only aquatic vegetation directly adjacent or within the area to be be dredged is impacted (smothered or removed).* • *No detectable impacts to aquatic vegetation located 100m from the dredge site.* • *Turbidity plume restricted to within 100m of dredge site and 10m of point of discharge from dewatering of supernatant water. Turbidity measurements not to vary between the control site (500m) and impact site (120m).*
Risk Analysis	What are the risks of this impact occurring (likelihood x consequence of the impact). *eg Turbidity* • *Spoil less than 1% silt/clay.* • *Volume of spoil 30,000 m^3.* • *Sensitive habitat located 400m of dredge site however unlikely to be reached by turbidity plume.* • *Duration of dredging is 2 weeks.* • *Risk = Medium (section 4.2).* Note: section 4 provides a broad scale risk analysis for impacts. While this offers guidance on determining potential risks associated with dredging activities, the EPA will undertake a more detailed risk assessment using an aspect impact register which assesses the likelihood and consequence of environmental harm, once the information is received from the applicant/licensee.

Controls	What operational controls will be implemented to minimise the risk of environmental impact? *eg Turbidity* • *Appropriate dredge equipment will be used will minimise generation of turbidity plumes.* • *Supernatant water will be treated using geotextile bags prior to discharge.* • *Monitoring program developed to detect impacts. Alarm and Hold triggers will be incorporated into the program.*
Monitoring	What monitoring will be undertaken to detect potential impacts? What parameters will be measured and what are the triggers that may signify an ALARM (assess impact and modify operations) or HOLD (stop works)? How will this be assessed to determine if the operational controls been effective? *eg Turbidity* • *Visual or drone video observations will be undertaken every two hours at the dredge site and discharge site to measure plume extent, direction and colour.* • *Turbidity recordings will be taken at 20m, 100m and 500m from the dredge head three times a day at the same times or after dredging has been operation for over 4 hours.*
Management actions	What actions will be undertaken to mitigate impacts should they be detected? Actions must be documented for each impact that has been identified via the assessment of the campaign. *eg Turbidity* In the event that ALARM triggers are exceeded: • *Monitoring of turbidity plumes by turbidity probe will increase to hourly if turbidity plumes are observed to extend beyond 100m of the dredge head AND* • *Works creating the plume will slow or stop until turbidity levels fall below the ALARM triggers OR* • *Dredging will move to a lower risk area OR* • *Dredge machinery will be taken offline to perform routine maintenance.* In the event that HOLD triggers are exceeded: • *Dredging will immediately stop*
Reporting	How will monitoring be reported and to who and when? *eg Turbidity* • *Results will be recorded daily on a record sheet and provided to EPA upon request. All water quality sampling data will be forwarded to the EPA in an MS Excel spreadsheet.* • *Any activations of HOLD triggers will be reported to the EPA within 24 hours.*

6.2 Long-term DMPs for routine maintenance dredging

Maintenance dredging refers to the removal of solid matter from the bed of waters that have already been dredged. It is usually required due to the build-up of organic matter or sediment. Considering this, it is expected that a dredge management plan (DMPs) has previously been developed and submitted to the EPA for the original capital dredging works or for subsequent maintenance campaigns.

The purpose of the long-term DMP is to identify the key impacts associated with dredging at a particular site, propose environmental management arrangements to manage these risks, and assess these arrangements after the completion of the dredge campaign to inform whether improvements can be made for future campaigns. Figure 3 demonstrates how this will facilitate the adaptive management of the dredge campaign and promote continual improvement.

This approach may be applicable to councils and businesses that undertake maintenance dredging on a regular basis, for example for maintenance of boat ramps or marina entrance channels. In these cases, the proponent may develop and submit a long-term DMP for the dredging of these sites where there is expected to be no changes to the dredge footprint and depth, dredge and spoil management methods, and disposal locations.

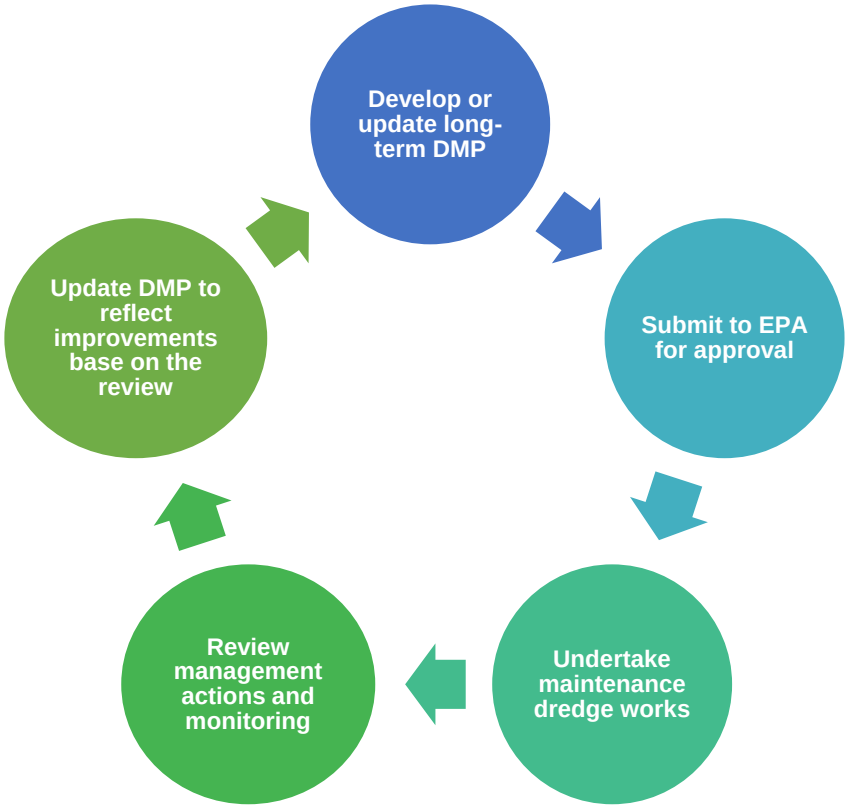


Figure 5 Promoting adaptive management and continual improvement for maintenance dredging

The EPA proposes to simplify the submission of DMPs for routine maintenance dredging providing the original plan has been approved after the release of the guideline. The information provided in the original DMP must meet the information requirements specified in section 5. The simplified process outlined in Table 4 can then be adopted by the licensee. A specific DMP will be required for each dredge site. Once the DMP has been finalised and approved by the EPA, approvals for subsequent works can follow the simplified process.

Table 4 Simplified process for maintenance dredging DMPs

No changes to equipment or methodology used for the dredging campaign. Same licensee. No complaints, compliance issues or adverse monitoring results.	→	Notification (including DMP) and schedule of works[13] provided to the EPA at least 5 business days prior to commencement of works.
Complaints received or monitoring triggers exceeded.	→	Provide the EPA with mitigation strategies or amendments to management practices that will minimise future issues. Update DMP and resubmit for EPA approval 20 business days prior to dredging.
Changes to methodology used, duration or time for the dredging campaign. Licensee undertaking the dredge campaign is different	→	Re-assessment of risk based on changes. Amendments to DMP and resubmission to EPA for approval 20 business days prior to dredging.
Increase in dredge footprint, significant increase in risk (high risk factors triggered), change of dredge licensee.	→	Re-assessment of risk as for capital dredging. Seek approval from planning authority. Development of new DMP and submission to EPA for approval.
5-year review	→	Review sediment composition, methodology and environmental data for best practice, environmental risks, mitigation measures, monitoring and reporting.

Once the DMP has been approved by the EPA, it will need to be reviewed after the completion of the dredge campaign. This will highlight any impacts or issues that may have occurred during the campaign and identify areas for improvement. An example template for this review is provided in Table 5.

Table 5 Example template for reviewing DMPs for maintenance dredging.

1 Duration of campaigns (days) and volume of spoil (m^3) removed

Year	***2018–19***				
July	eg 3,000 m^3 (10 days)				
August					
September					
October					
December					
January					
February					
March					
April					
May					
June					

[13] Definition of schedule of works: means a timeline of the dredging and dewatering campaign inclusive of dates for mobilisation to site, construction of dewatering infrastructure, dredging, demobilisation, decommissioning, disposal and removal of all equipment and spoil from the approved locations.

2 Changes in composition of spoil (based on visual or historical information). Sediment testing triggered in the event of a known spill or after 5 years). Include fate of spoil.

Date	Changes observed/measured	Resulting alterations in management of dredge campaign or management responses
	eg Encountered clay and or silt during dredging which was unexpected. This resulted in increased turbidity.	eg Changed dewatering methods to manage fine silts and increased water quality monitoring at the dewatering site. Used flocculants in sediment basin.

3 Compliance issues

Date	Compliance Issue	Action taken
	eg Fuel spill during refueling of vessel which was not contained.	eg Notified EPA. Cleaned up spill. Reviewed spill management procedures including staff training and checking spill kit contents. Assessed why spill occurred and fixed problem.

4 Community complaints

Date	Summary of complaints received	Corrective actions or improvements made for future campaigns
	eg Odour complaints from nearby residents.	eg Assessed what was causing odour. Engaged with residents to explain why odour was occurring and how long it would be present. Ensure that appropriate consultation occurs next time.

5 Monitoring results

Date	Summary of water quality monitoring results	Corrective actions or improvements made for future campaigns
	eg Exceeded triggers for dissolved oxygen on three occasions.	eg Works on hold. Increased visual monitoring on fauna. Updated water quality monitoring plan.

6 Next campaign

- Describe any differences proposed compared with previous campaigns and reason why with respect to:
  - dredge methodologies
  - footprint of dredge location and spoil volumes
  - expected sediment composition
  - spoil management.
- Provide a schedule of works for the dredge campaign which includes proposed dates for the deployment of equipment, dredging works, dewatering/management of spoil and decommissioning of site.

7 Environmental monitoring plans

A monitoring program should be developed by a suitably qualified person. It is recommended that the EPA be consulted during the development of monitoring programs especially for medium and high-risk dredge campaigns.

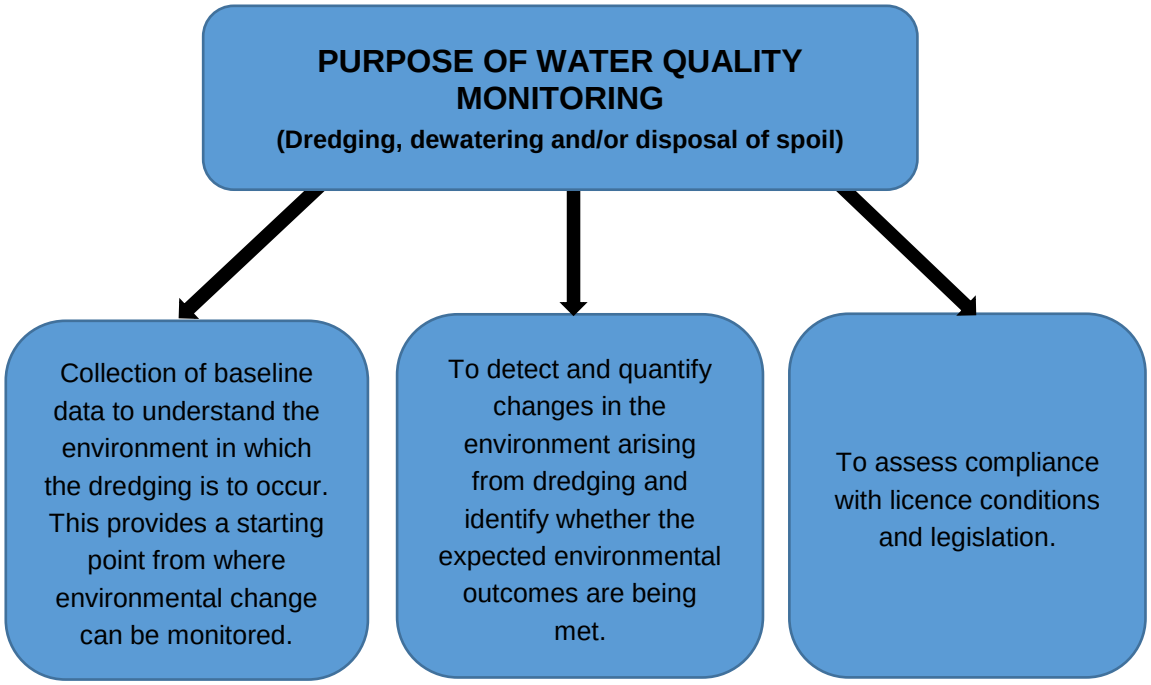
7.1 General requirements

Environmental monitoring may be required as part of the DMP to ensure compliance with EPA legislation and that any impacts that may result in environmental nuisance or harm detected and appropriately managed. Preparation of an effective monitoring program ensures that controls are protective of the environment and the monitoring is conducted effectively and consistently and will deliver reliable, good quality data. It will also help demonstrate that the dredge campaign will be undertaken in a responsible manner and environmental impacts will be identified and managed. Monitoring requirements may also be captured as licence conditions.

Monitoring is mainly undertaken during the dredge campaign. Longer-term monitoring that captures pre- and post-dredging may be required depending on the nature and scale of the potential impacts of the project. Monitoring requirements should be discussed with the EPA at the DA stage to ensure adequate resourcing of this component is allocated and the expectations of the EPA with regard to methodology can be met. Alternatively, if a DA is not required, monitoring needs to be discussed with the EPA during the development of the DMP.

7.2 Water quality

Water quality monitoring may be undertaken for different purposes.



Water quality monitoring will be required for every dredge campaign. The level of monitoring will be determined by risk which is broadly outlined in Figure 4.

7.2.1 Components of a water quality monitoring plan (WQMP)

The monitoring pan for the dredge site and dewatering or disposal location should include the following:

- **Monitoring objectives** that describe why monitoring is being undertaken.
- **A description of the receiving environment** that may be impacted.
- **Identification of potential impacts** that need to be monitored and the required outcomes that need to be achieved.
- **Selection of indicators/parameters** that will measure environmental impacts.
- **Sampling procedures** including sampling methods and equipment, calibration procedures, filtering, decontamination and preservation techniques, and analytical methods.
- **Sampling times and/or frequency**.
- **Triggers for ALARM** (eg slow works, move dredge location, wait for better weather conditions**) and HOLD** (stop all dredging works until thresholds are within appropriate levels).
- **Contingencies and management actions** should a trigger be exceeded or an impact be detected.
- **Monitoring of background conditions** unaffected by dredging to define natural turbidity events and magnitude.
- **A map showing the sampling locations** (including control sites), major infrastructure, dredge and dewatering sites, disposal site, sensitive environmental receptors.
- **The method and frequency of reporting** for both management and compliance purposes including who, when, how and what will be reported.
- **Feedback loop** that supports adaptive management of the dredging activity.

It is important that the appropriate monitoring equipment is selected and calibrated, and is used by a qualified operator. This is to ensure that results are accurate and reliable, and to avoid activating any triggers unnecessarily, or not activating a trigger when levels have been exceeded therefore increasing the risk of impacts and environmental harm.

A water quality monitoring program (WQMP) needs to be approved by the EPA and can be provided as part of the DMP. Results to be provided to the EPA upon request and at completion of the campaign with raw data documented using an EPA approved Excel spreadsheet. Testing of water samples must be undertaken by a NATA accredited laboratory.

7.2.2 What parameters are measured?

Water quality parameters that may be required include the following:

Turbidity
• **Requirement** – some form of turbidity monitoring will be required for all dredge campaigns. Level of monitoring will depend on whether the risk of the campaign (refer to Figure 4 for level of monitoring and section 4.2 for level of risk) • **Equipment** – can include visual recordings such as drones and videos for low-risk campaigns, however monitoring will need to include a point of reference such as a buoy. Higher-risk campaigns will require the use of turbidity meters, loggers and may require real-time monitoring. • **Location and frequency –** will depend on sediment composition, location of sensitive habitats, dredge equipment used, location of spoil disposal/dewatering site, dewatering methods and direction of currents. Generally campaigns with a higher risk of turbidity will require more frequent and detailed monitoring.

- **Triggers –** will need to be site specific as they may need to consider natural background levels at the dredge site, the location of sampling points and proximity to sensitive habitat. Trigger levels should be discussed with the EPA when developing the WQMP.

Dissolved oxygen (DO)

- **Requirement** – will be required if spoil is anoxic or contains organic matter, or dredging is likely to create anoxic conditions.
- **Equipment** – oxygen probes.
- **Location and frequency –** will depend on amount of organic matter or anoxic sediment present in the spoil, the proximity of aquatic fauna that may be impacted by low dissolved oxygen levels, and the duration of the dredge campaigns. Generally this data is collected at the same frequency as turbidity.
- **Triggers**:
  - >75% (6 mg/l) saturation is optimal for aquatic fauna health
  - <75% (6 mg/l) saturation indicates decline in DO and equipment should be checked
  - <65% (5 mg/l) saturation is an ALARM trigger where dredging rate should be reduced, relocated and sampling frequency increased
  - <55% saturation (4 mg/l) indicates low DO levels which are a risk to aquatic fauna health. Observations may be made of stressed or dying fish within surface waters. HOLD works must be implemented with a reading of 55% saturation or less. EPA should be notified and works should only recommence once DO levels are above 65% saturation.

pH

- **Requirement** – if acid sulfate soils are present at the dredge or disposal location and will be disturbed during dredging or disposal.
- **Equipment** – pH meters, probes or chemical analysis.
- **Location and frequency –** will depend on location of acid sulfate soils and current flows.
- **Triggers** – Generally pH readings +/−1 require an ALARM response. Readings below a pH of 6 or below indicate the presence of acid sulfate soils and will trigger a HOLD response and appropriate management response.

Ecosystem health (vegetation including aquatic and terrestrial)

- **Requirement** – if there is a risk to ecosystem health which depends on sediment composition (eg presence of silts/clays or contaminants), proximity of dredge, dewatering or spoil disposal site to sensitive habitats and length of dredge campaigns. Most predominant form of monitoring is undertaken to assess impacts from dredging on seagrass or reef ecosystems.
- **Equipment** – usually include visual recordings using cameras (video or stills) that may analyse presence/condition of vegetation.
- **Location and frequency –** will depend on location of sensitive habitats and direction of currents or flow. Generally higher-risk campaigns will require more frequent monitoring and a BACI (Before After Control Impact) design.
- **Triggers** – will depend on the composition of the benthic environment and level of protection required for the location (eg marine park, conservation area).

7.2.3 Selecting sampling locations, indicators and triggers

The selection of sampling points, indicators, testing frequency and triggers will need to consider the extent of impacts that is predicted to occur as a result of dredging. This needs to take into account background information which identifies the natural conditions that occur at the dredge and/or disposal site. This should be informed by the collation of information required for dredge applications as specified in section 5 and the assessment of risk that should be undertaken when developing a dredge management plan (section 6). The potential for impacts will decrease moving further away from the dredge and/or disposal site.

For the purposes of assessing risk and subsequent monitoring, the categorising of impacts can be defined into three zones (Figure 6 and Figure 7). Monitoring and adaptive management for these zones will have differing objectives. This approach can help inform the selection of sampling points, indicators to be monitored and management triggers. Control or reference sites selected for monitoring ideally need to be located outside of these zones.

Zone 1: Zone of High Impact (ZoHI)

Impacts on the benthic environment are predicted to be irreversible and is unlikely to recover. This zone is usually at the location or directly adjacent the proposed dredge site and/or disposal site. For this zone, it is unlikely to require monitoring for benthic impacts however monitoring primary indicators such as the monitoring of turbidity plumes directly resulting from dredging may assist in providing early warning signs of potential impacts further away from the site (Note: Native vegetation clearance approval from the Native Vegetation Council (DEW) or a Water Affecting Activities Permit from Landscape SA may be required if seagrass or other vegetation is to be removed).

Zone 2: Zone of Moderate Impact (ZoMI)

Impacts resulting from dredging are predicted to recover within a defined time frame (~ 5 years). This is the key focus area for monitoring as it is the transition area between where permanent impacts and no effects are predicted. Monitoring in this area should include indicators that measure the direct impacts from dredging (e.g. turbidity and oxygen levels), and indicators that measure ecological response (e.g. health of ecological communities). This area may also be subject to Before After Control Impact (BACI) monitoring to identify if the ecosystem has recovered after dredging for higher risk projects.

Zone 3: Zone of Influence (ZoI)

Changes in water quality data associated with dredge plumes is likely to occur however should not result in detectable impacts to aquatic plants and animals. Monitoring in this area will focus on whether there has been any detectable impacts as a result of dredging. It is envisaged that this type of monitoring will only be required for those projects that have a high risk of impact.

Figure 6 Zones of impact – objectives

The location of each zone boundary will be determined by a number of factors including direction of currents, tidal flow, weather conditions at the time of dredging, location of sensitive habitats and the equipment used for dredging. The aim is to minimise the area associated with the ZoHI and ZoMI and to ensure impacts do not occur within the ZoI. The EPA will expect that dredgers demonstrate they will do everything reasonable and practical to meet the objectives of these zones and minimise the potential for environmental harm within the ZoMI and ZoI. This will be assessed by the EPA based on

the information that is received during the application stages (development application, licence application or review of the DMP).

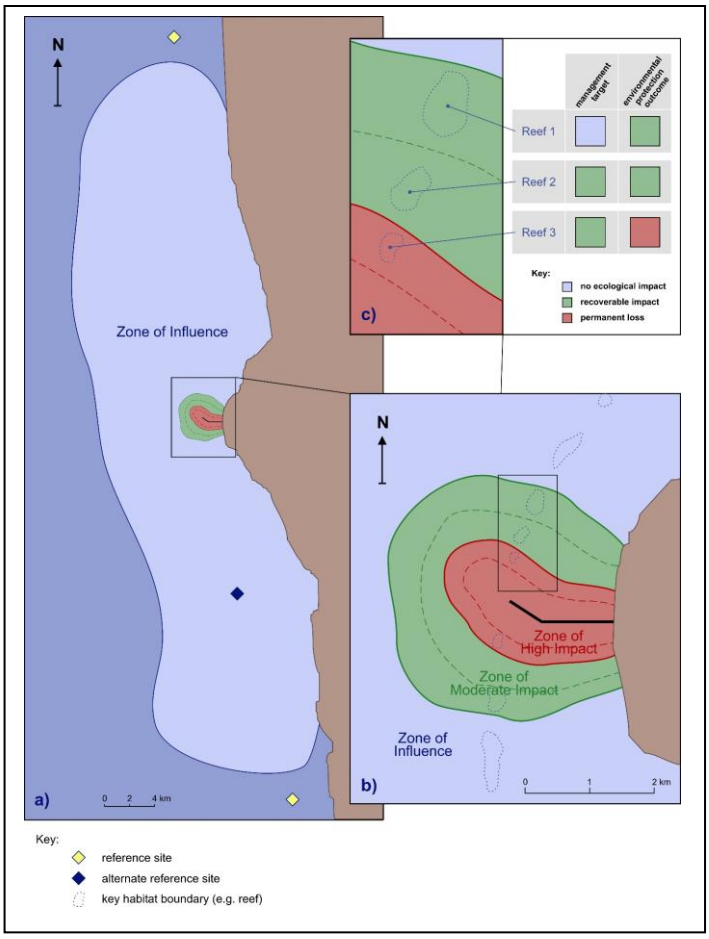
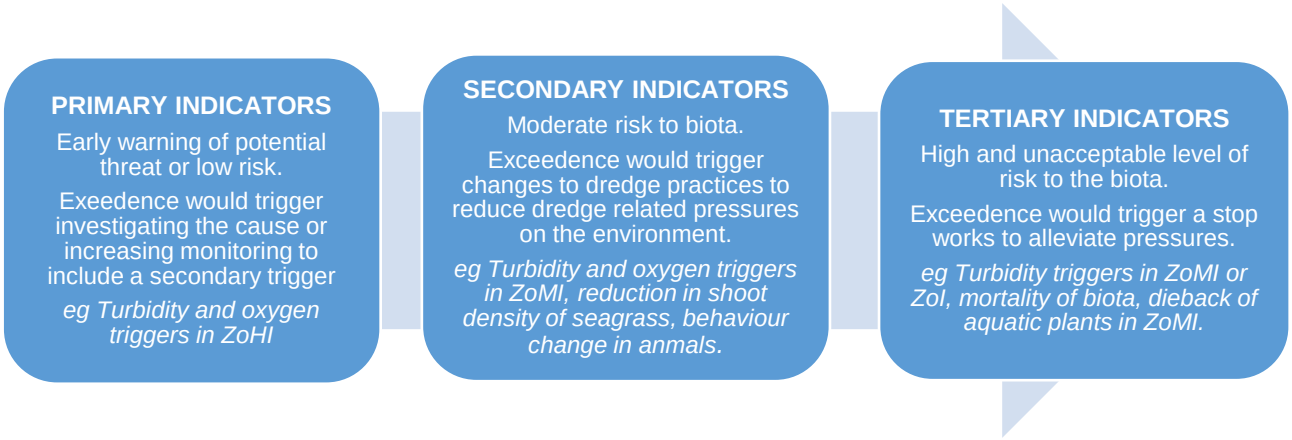


Figure 7 Zones of impact – boundaries

An example map-form presentation of: (a) the predicted Zone of Influence and the predicted zones of High Impact and Moderate Impact associated with channel dredging, (b) closer view of the predicted Zones of High Impact and Moderate Impact, noting that the area between the broken lines (inner) and solid lines (outer) represents the uncertainty associated with the location of the zone boundary, and (c) zoomed in section showing the management targets and expected environmental outcomes for the zones and the area of uncertainty within the zones (*referenced with permission from EPA WA in Technical Guidance – Environmental Impact Assessment of Marine Dredging Proposals, December 2016*).

Appropriate indicators will need to be selected to signify potential risks of impacts that may occur from dredging. Selection and implementation of these indicators will depend on the level of risk posed by the dredge campaign and/or whether a trigger has been exceeded. Indicators can be defined as:



Once indicators are selected, triggers will need to be determined to inform the dredger when impacts may be likely or have occurred. There are two types of triggers that are required the EPA.

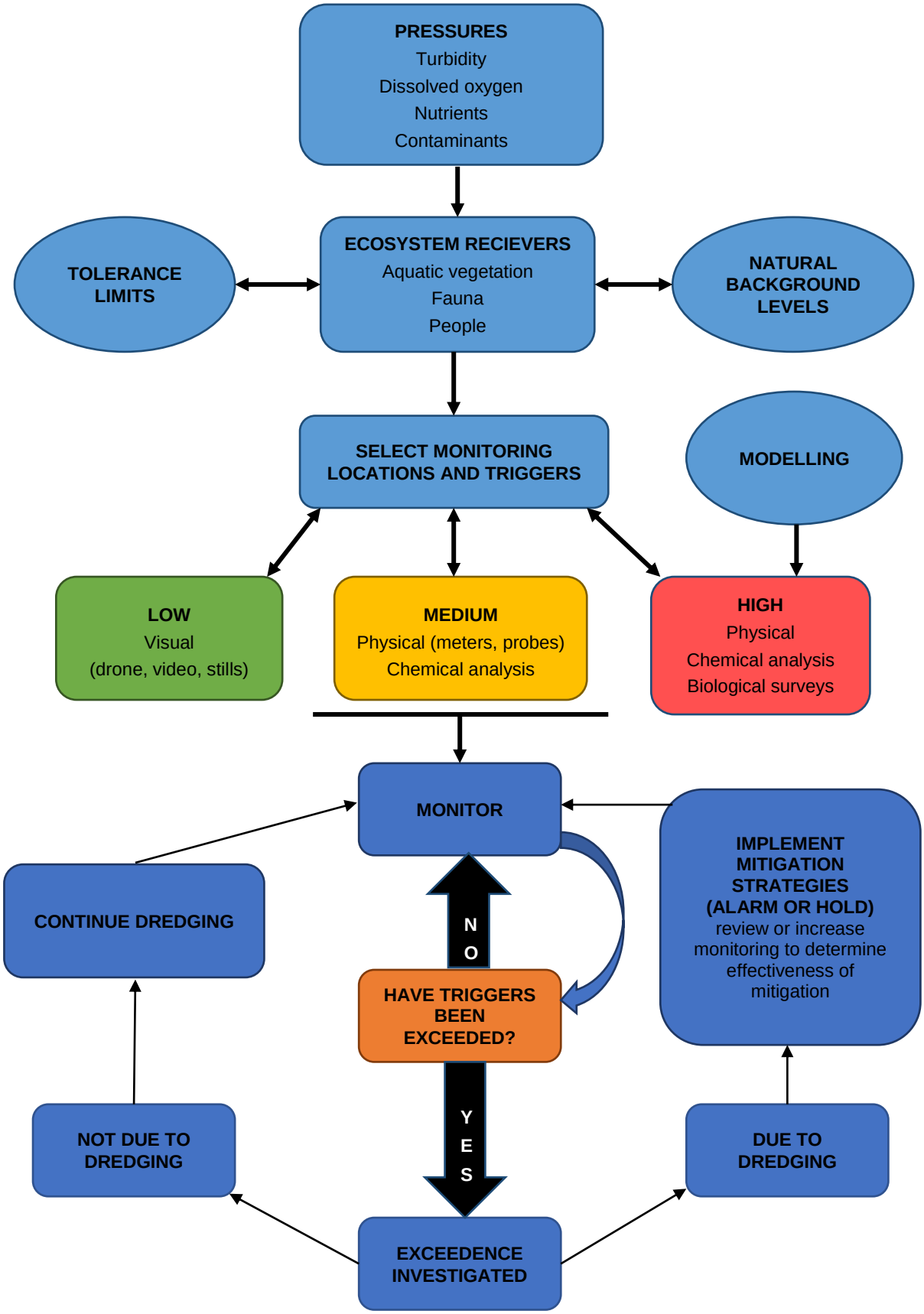
- ALARM triggers are set to forewarn of the approach of the HOLD trigger and avoid non-compliance and the potential for environmental harm. This will initiate a management response to minimise the potential for impacts such as slow works, move the dredger to another location with the dredge site or wait for better weather conditions.

- HOLD triggers represent the limit of acceptable impacts beyond which there is likely to be a significant effect on the environment. It indicates that an environmental outcome is not being met and therefore initiates a stop all dredge works until thresholds fall below the trigger level.

Data sources

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* provides guidance for the development of water quality monitoring programs, https://www.waterquality.gov.au/anz-guidelines/monitoring
- International Association of Dredging Companies (IADC), *Facts about Environmental Monitoring* provides a very good overview on the aims and requirements of environmental monitoring, https://www.iadc-dredging.com/wp-content/uploads/2017/03/FA2020-01-Environmental-Monitoring.pdf
- Reef life survey
- Envirodata

7.2.4 The monitoring cycle



7.3 Air quality and noise

The monitoring of impacts from noise, odour and dust is primarily undertaken using a complaints register. This will be required when there is a risk of air quality and noise impacts to nearby sensitive receivers including (but not limited to) residents, community and sports clubs, and recreational users of the area.

The DMP should include how community affected by dredging activities will be engaged and how complaints will be managed. Those measures should include:

- identification of the person with responsibility for managing communications and complaints;
- a communications plan that outlines how and when consultation with potentially affected parties will be undertaken, and how potentially affected parties will be informed in advance of works that may have an off-site impact;
- maintenance of a complaint register (required by licence conditions) to record the following information
  - the name and address of any complainant
  - the time and date that the complaint was received
  - a description of the complaint
  - the activity or activities and any associated equipment that gave rise to the complaint
  - the action that was taken to resolve the issues that led to the complaint
  - the date the complaint was resolved and documentation of complainant's level of satisfaction with the actions to resolve the issue.

Following the completion of the dredge campaign, the EPA can be notified of complaints regarding environmental nuisance (particularly noise, dust, odour) that were received, and the actions undertaken to resolve the complaint.

Further guidance on developing consultation plans can be found in the EPA Guideline for community engagement.

Additional odour or monitoring may be required if the risk of impacts to sensitive receivers is considered high. This may occur if spoil contains anoxic sediment, organic matter or acid sulfate soils, and dredging is undertaken over several weeks. The EPA will advise on the requirement and scope of monitoring if there is a risk.

8 Sediment composition analysis

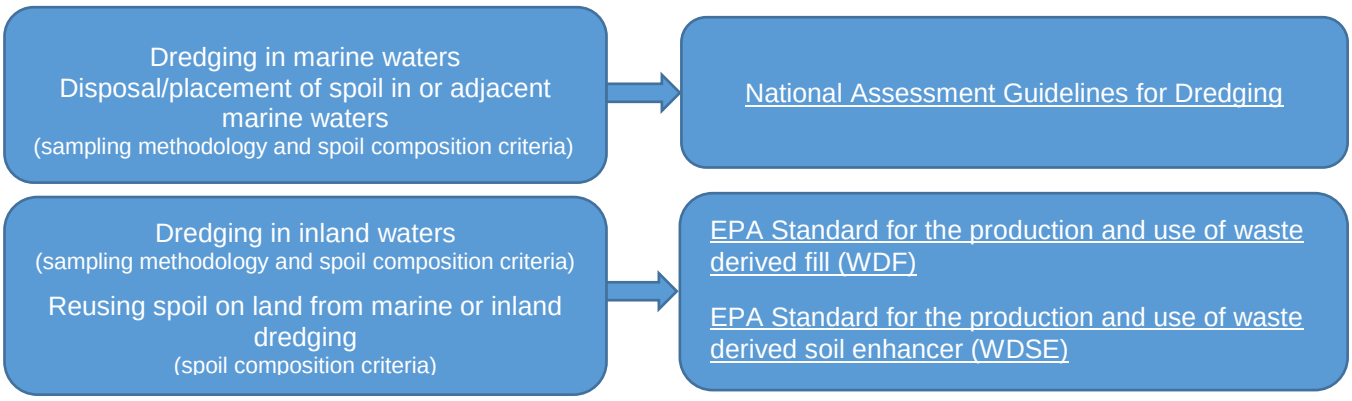
The EPA will require an analysis of sediment composition to be included in the development application, or if none is required, as part of the EPA licence application. Knowing the sediment composition of a dredge site will help minimise the potential for risks to the environment and human health. It will inform best practice handling, environmental monitoring requirements and reuse/disposal options for spoil.

Analysis of sediment composition may be required to identify grain size of sediment to be dredged and whether there are any potential contaminants, eg hydrocarbons, metals, tributyltin, PFAS, acid sulfate soils, pesticides and industrial chemicals present in the spoil. This is predominantly required for the dredge site however may also be required for the disposal and dewatering site if there is a risk of contamination of sediments in that area where contaminants may become mobilised during spoil disposal or dewatering.

The extent of sampling and testing required will depend on environmental risk. This may depend on:

- Location of the dredge, dewatering or disposal site (eg high energy, pristine or industrial, recreational use, etc);
- Potential for contamination based on location of the dredge, dewatering or disposal site and for the resuspension and dispersion of contaminants during dredging or dewatering;
- Whether there is potential for the dredge, dewatering or disposal site to be contaminated;
- Proximity of sensitive habitats to the dredge, dewatering or disposal site;
- Volume of spoil to be removed;
- The time between dredging campaigns for maintenance dredging (~5 years).

If sampling and analysis of the sediment within the dredge site are required, the procedure (sampling number and method, parameters measured) will need to be consistent with the following guidelines or standards.



Sampling of sediments must cover the full dredge area and dredge depth

It is encouraged that an applicant consult with the EPA prior to undertaking any collection or sampling analysis to ensure the appropriate methodology is used. This will reduce the risk of the EPA requiring additional sampling if there are any inadequacies once the application has been submitted or sampling has been undertaken.

8.1 Parameters for testing

8.1.1 Particle size and organic matter

Particle size will impact the magnitude, duration and dispersal of turbidity plumes that results from dredging and spoil disposal if this is proposed to occur in the aquatic environment. Particle sizes will generally be dictated by geomorphology, wave energy, current flows and water flow.

The Wentworth scale[14] broadly characterises particles sizes into:

COARSE GRAINS >2 mm	
Gravel and Coarse sand	Generally settle close by the dredge site and become part of the overall bed load and sometimes contribute to the direct impacts.

MEDIUM GRAINS 2 mm to 64 µm	
Sands	Tend to settle but are more readily re-suspended and re-deposited by the action of waves and currents.

FINES <64 µm	
Silts and Clays	Tend to remain in suspension for long periods (hours to weeks) and can be distributed by currents over long distances and, in some situations, lost from the local sediment system.

Organic matter may consist of dead or live aquatic vegetation or decaying flora and/or fauna that is entrained as anoxic sediments. Disturbance and removal of organic matter or anoxic sediments may result in decreases in oxygen levels, and rises in nutrients and algal blooms which may cause mortalities of aquatic fauna. In addition, organic matter may cause odour issues when spoil is dewatered and/or stockpiled.

Data sources

- Visual inspections of the dredge site.
- eAtlas – information on sediment grain size.
- CSIRO Sediment Quality Assessment: A Practical Guide – information on sediment testing.
- National Assessment Guidelines for Dredging – information on requirements for sampling sediment size.
- Location maps – location of marine parks, sediment composition, etc.

[14] Wentworth CK 1922, 'A scale of grade and class terms for clastic sediments', *The Journal of Geology* 30(5):377–392.

8.1.2 Chemical contaminants

The contamination status of the site to be dredged and dewatering site must be established prior to dredging. The history of uses that may contribute to contamination of sediments in the area must be documented and previous analysis of contamination or dredging at the site summarised. Where the site history indicates contamination is unlikely or where clean sand is being dredged, or a very small amount of dredging is involved, measurements of contaminant concentrations may not be required. The choice of contaminants to be measured will be based on the site history and the volume of material to be dredged. This should be determined by a person with qualifications and/or expertise in this area.

Contaminants that may be present in spoil and/or sediments located at the dewatering site include hydrocarbons, acid sulfate soils, tributyltin (TBT), chromated copper arsenate (CCA), per- and poly-fluoroalkyl substances (PFAS), pesticides, industrial chemicals and metals.

Potential sources of contaminants may include:

- industrial and residential discharges or spillages;
- industrial uses, eg wharves, marinas;
- stormwater;
- surface runoff from agricultural areas;
- sewage and wastewater treatment effluents;
- transport from upstream contaminated sediments;
- recreational use and boating, eg fuel/oil spills.

If any of these sources are identified on or near the dredge site or dewatering site, further sampling will be required. In addition, consideration to be given to the quality of sediment that is to be used to construct supporting infrastructure such as dewatering ponds, coffer dams or bunds.

Results of sampling will need to be compared against the NAGD if spoil is to be placed back into the marine environment and the EPA standards for WDF or WDSE if spoil is to be recycled or reused on land.

Data sources

- EPA Public Register – provides information on licenced sites that may result in contaminants..
- National Pollution Inventory – lists the nature and volume of pollutant emissions from industry.
- Nature Maps – provides information on actual and potential location of acid sulfate soils and sensitive habitats.
- Location SA Map Viewer – contains maps of industry areas which may be sources of contaminants.
- DPTI Guideline for assessment and management of acid sulfate soils – provides information on sampling and assessment of acid sulfate soils.
- Water Quality Australia acid sulfate soils – provides information on sampling and assessment of acid sulfate soils including for dredging and dewatering.
- CSIRO Sediment quality assessment: a practical guide – information on sediment testing.
- EPA Standard for the production and use of waste derived fill – information on EPA requirements if spoil is going to be reused as fill.
- EPA Standard for the production and use of waste derived soil enhancer if spoil is to be used as a soil enhancer.
- National Assessment Guidelines for Dredging – if spoil is to be placed into the marine environment.

8.1.3 Physical contaminants

Waste plastics and other rubbish are becoming increasingly common in our waters. Mobilisation of waste not only presents a risk to our aquatic animals, it can also cause operational issues for dredging equipment.

The presence of plastics in sediments would predominantly result from stormwater runoff and littering. If the dredge site could be impacted by runoff from any nearby stormwater discharges or located near high public use areas, it is recommended that further analysis is undertaken to identify if any plastics and other rubbish are present in the sediments to be removed during dredging.

Data sources

- Location SA Map Viewer – maps stormwater drains which can be sources of rubbish

8.2 Sampling and analysis plans

If sampling is required, a sampling analysis plan must be prepared by a person with qualifications and expertise in this area and include (but not limited to):

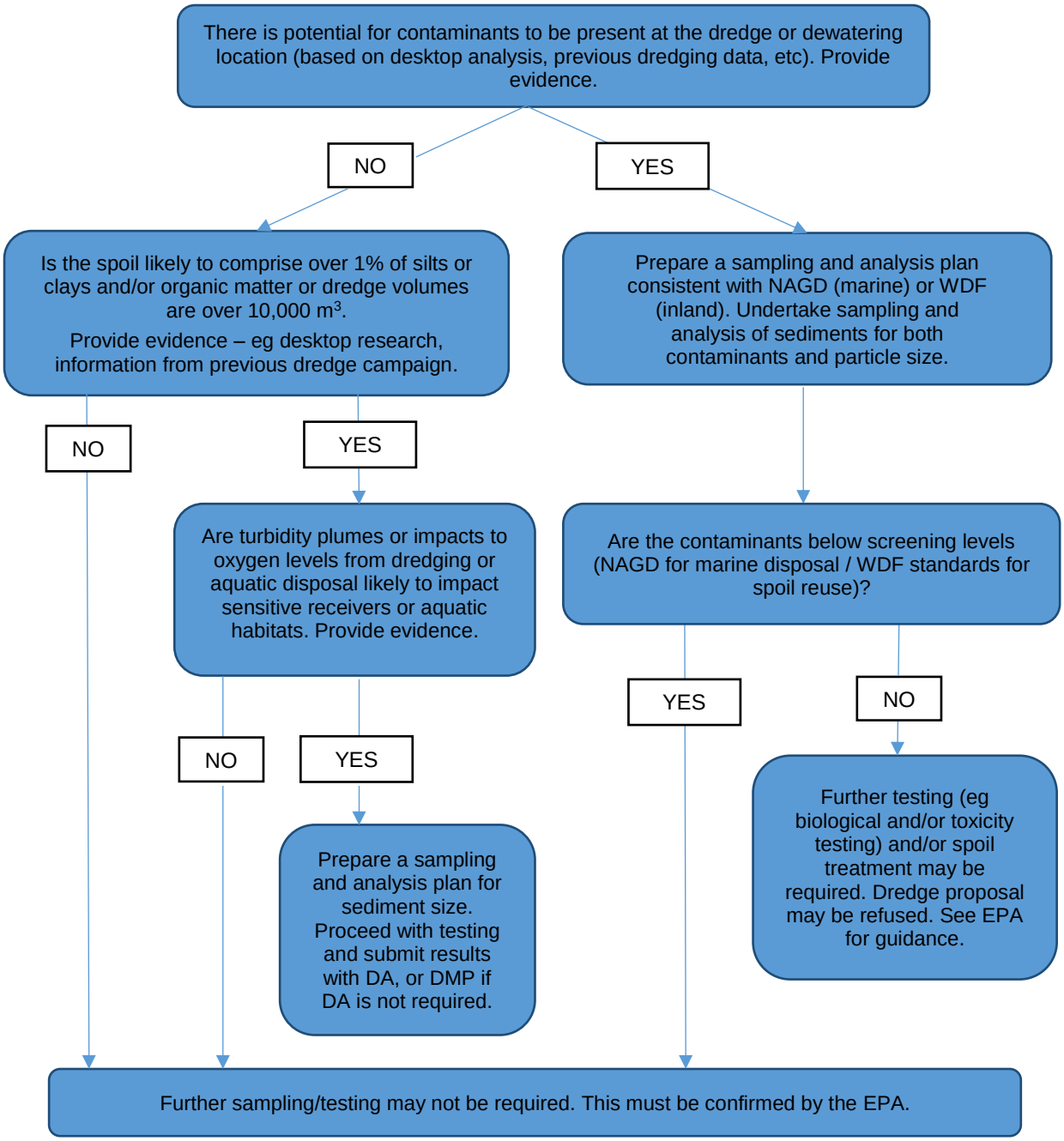
- Sampling rationale, locations and sampling numbers;
- Parameters that will be sampled based on a desktop risk analysis (eg site history, land use, likely contaminants, previous data);
- Who will carry out the testing (this must done by a NATA accredited laboratory that is endorsed for the testing that is to be undertaken);
- Sampling methodology (location and depth of sample points, collection and analysis). Sampling must be spread randomly across the dredge site and over the full range of the proposed dredge footprint and depth;
- Contingencies for potential requirements for elutriate and bioavailability analysis and toxicity testing (eg additional samples and storage of samples);
- Data analysis and reporting.

Further guidance on developing sampling analysis plans and undertaking sediment testing can be found here:

- CSIRO Sediment quality assessment – a practical guide
- National Assessment Guidelines for Dredging NAGD (Appendix A and B)
- Standard for the production and use of waste derived fill WDF (Appendix 3).

8.3 EPA expectations for sampling

This flowchart provides a broad overview of sampling requirements for the analysis of sediment composition. For maintenance dredging, it is expected that a sampling analysis is undertaken using this flow chart if the area has not been dredged for more than five years or if there is a likelihood that contamination has occurred at the site since the last dredge campaign.



9 Environmental checklist

This checklist is a voluntary tool which aims to inform dredge licensees if they are meeting EPA requirements by undertaking a self-audit of their operation. It can also be used by relevant government agencies to check compliance with environment protection legislation during site visits. The requirements in this checklist reference the 'MUSTS' specified in section 4. The licensee can also add site-specific licence conditions to this checklist.

The checklist comprises three key components associated to dredging:

- Removal of spoil from the dredge location.
- Management of spoil including treatment, placement and/or disposal.
- Operation of site compound where equipment and substances are stored, used and maintained.

9.1 Scoring the checklist

The checklist is scored based on the findings observed while undertaking all activities associated with dredging. This includes the dredge site, the site where spoil will be placed and treated, and the site compound where equipment and materials (eg fuels and chemicals) are used, stored and maintained. The scoring system reflects a traffic-light approach to identify areas that are compliant, require some improvement, or have resulted in a breach of legislation or environmental harm.

The table below provides an explanation of each scoring category and actions that you should be taking in response to the findings. The EPA adopts a risk-based approach to regulation and will support any dredge licensee who aims to take all reasonable and practicable measures to meet requirements and minimise the potential for environmental harm which may be caused by discharging, depositing or emitting a pollutant.

Category	Explanation	Action required
Compliant (C)	The operation meets this requirement.	Document evidence that demonstrates compliance. No further action.
Opportunity for Improvement (OFI)	Requirement is met however is not best practice. This may result in environmental harm or breaches of legislation if improvements are not made in the future.	Undertake risk assessment to identify potential for non-compliance. Identify and document opportunities for improvement if required.
Minor non-compliance (Minor NC)	Requirement has not been met however no environmental harm is evident or the potential for environmental harm as a result is low.	Action is required to make sure that requirement is met within a specified time period which is written on the checklist.
Major non-compliance (Major NC)	Requirement has not been met and there is a significant risk of environmental harm or environmental harm has occurred as a result.	Immediate action is required to rectify the situation. Re-analyse within four weeks to ensure the corrective action has been successful. **The EPA must also be notified as soon as reasonably practicable if the harm is considered serious or material.**

9.2 EPA checklist

Select applicable sites:

☐ Dredge site

☐ Spoil disposal, placement, dewatering site

☐ Site Compound (where dredge equipment is stored or maintained)

Licensee: _____ **Site location:** _____

Performed by: _____ **Date:** _____

Requirement	**Findings ☑**				• **Evidence (even if not applicable)** • **Opportunities for improvement** • **Actions**
	C	**OFI**	**Minor NC**	**Major NC**	
Seagrass, algae or other plants are not being damaged or lost beyond the dredge site or at the spoil disposal or dewatering site. This may be identified through monitoring or visually observed.	☐	☐	☐	☐	
Impacts to waters are not causing humans to become unwell or animals and fish to become unwell or die.	☐	☐	☐	☐	
Turbidity and dissolved oxygen measurements are meeting the ALARM triggers specified in the water quality monitoring plan. Any activation of ALARM or HOLD triggers have been appropriately actioned.	☐	☐	☐	☐	

Requirement	Findings ☑				• Evidence (even if not applicable) • Opportunities for improvement • Actions
	C	OFI	Minor NC	Major NC	
Contaminants such as hazardous materials (eg metals, PFAS, etc) or plastics are not being released into the environment or causing adverse impacts when removing or dewatering spoil.	☐	☐	☐	☐	
Spoil contaminated with hazardous substances is treated and/or disposed of at appropriate licensed facilities (waste receipts).	☐	☐	☐	☐	
There are no complaints from users of the area including recreational and commercial users which may result from increased turbidity or release of organic matter or other pollutants. Any complaints are appropriately being addressed.	☐	☐	☐	☐	
Odour, noise and dust that may be emitted from the site are not impacting nearby residents or people who use the area. Any complaints are being recorded and addressed.	☐	☐	☐	☐	
Dolphins, seals and other marine megafauna are not being impacted by dredging (noise, physical disturbance). Appropriate management actions are in place to minimise potential impacts.	☐	☐	☐	☐	

Requirement	Findings ☑				• Evidence (even if not applicable) • Opportunities for improvement • Actions
	C	OFI	Minor NC	Major NC	
Spoil is being managed appropriately to minimise loss, spillage and leakage during transport.	☐	☐	☐	☐	
Dredge vessel maintenance and refuelling practices are managed to prevent fuel from entering the aquatic environment (availability of containment, spill kits). Any spills are cleaned up immediately.	☐	☐	☐	☐	
Equipment is being checked regularly to minimise the potential for breakages and spills.	☐	☐	☐	☐	
Generators, fuel tanks, oil containers and other similar equipment are located / housed in a manner that will contain any leaks or spills onto land or into stormwater or the aquatic environment.	☐	☐	☐	☐	
Hazardous substances such as oily rags, waste oils and fuels are being stored appropriately to prevent contamination and disposed of at an appropriate facility licensed to take this waste (waste receipts).	☐	☐	☐	☐	
Waste such as food wrappers, drink containers, cigarette butts, etc. are being contained and disposed of appropriately onshore (eg kerbside disposal or recycling or licensed waste facilty) or reused/recycled.	☐	☐	☐	☐	

Requirement	Findings ☑				• Evidence (even if not applicable) • Opportunities for improvement • Actions
	C	OFI	Minor NC	Major NC	
Stormwater runoff is not being contaminated by rubbish or hazardous substances (eg fuels and oils) in the event of rain.	☐	☐	☐	☐	
Dredge campaign is being undertaken as specified within the approved DMP.	☐	☐	☐	☐	
Licence conditions are being complied with. Note: Individual licence conditions or requirements can be added to this checklist.	☐	☐	☐	☐	
Add licence conditions.	☐	☐	☐	☐	

10 Glossary

ACID SULFATE SOILS: soils, sediment or rock in the environment that contain elevated concentrations of metal sulfides (principally pyrite FeS2 or monosulfides in the form of iron sulfide FeS), which generate acidic conditions when exposed to oxygen. Acid sulfate soil materials include potential acid sulfate soil material (sulfidic material) and/or actual acid sulfate soil material (sulfuric material), both of which can occur in the same soil profile. See EPA Guideline: Site contamination – acid sulfate soil materials.

ALGAL BLOOMS: a large population density of phytoplankton. Such blooms are normal but become of concern when the species in the bloom are toxic.

ANAEROBIC/ANOXIC SEDIMENTS: sediments lacking in oxygen. They usually contain high levels of iron sulfide causing them to be black in colour. Anaerobic sediments release hydrogen sulfide (smells of rotten eggs) gas when exposed to air.

BACI – BEFORE AFTER CONTROL IMPACT: a method of evaluating anthropogenic impacts on receiving environments where predicted impact and control sites are monitored before and after a planned activity to infer whether impacts have occurred as result of the activity.

BAT: Best available technology that is economically achievable.

BEACH WRACK: the accumulation of organic material (eg seagrass or algae) that is washed up onto the beach by the tides, wind and waves that eventually breaks down and is recycled back into the system. See Coastline Factsheet – What is beach wrack.

BENTHIC SURVEY: a description of the seafloor (for the site of the dredge site or ocean disposal site) and includes information about:

- the substrate on the site (eg reef boulders, pebbles, sand, silt);
- types and sizes of sediment;
- water depth; and
- fauna and flora.

BUND: a wall, moat or other device which is graded or contains grated drains, or combines the two, which is designed to prevent the escape of spilt materials and to exclude stormwater runoff.

CLOSURE PLAN: a document to be prepared and implemented by the licensee which includes the actions to be taken to prevent or minimise environmental harm during the closure and post-closure phase of a licensed activity.
See Preparation and implementation of closure and post-closure plans.

COMMENCE DREDGING: the time at which removal of solid matter from the bed of any waters by any approved digging or suction apparatus occurs, excluding the establishment of site offices or other land-based facilities, other preparatory work to dredging or any works carried out for the establishment of a visual aid to navigation.

COMPLETION OF DREDGING: the time at which the removal of solid matter from the bed of any waters by any approved digging or suction apparatus, and any transportation and disposal of the solid matter, ceases.

CONTAMINANT: a chemical substance that has no beneficial effects for the stated purpose and has the potential to cause harm to the environment, human health, or primary industries.

DREDGE MANAGEMENT PLAN (DMP): a document to be prepared and implemented by the licensee, which must confirm the scope, methodology, environmental management, contingency and incident response arrangements for the project.

DREDGE OVERFLOW: the discharge of supernatant water and entrained fine sediments separated from the dredge spoil on board the dredge vessel(s).

DREDGE SPOIL DISPOSAL: the placement of any solid matter (which has been removed from the bed of any waters) into waters or on to land at its final resting place.

DREDGING (CAPITAL): removing solid matter from the bed of any marine waters or inland waters by any digging or suction apparatus, but excluding works carried out for the establishment of a visual aid to navigation and any lawful fishing or recreational activity.

DREDGING (MAINTENANCE): the excavation of material from the bed of any marine or inland waters by any digging, cutting, suction or any other means for the purpose of maintaining a previously dredged (approved) depth, width and area in marine or inland waters'.

EARTHWORKS DRAINAGE (EWD): the conduct of earthworks operations in the course of which more than 100 kilolitres of wastewater containing suspended solids in a concentration exceeding 25 milligrams per litre is discharged directly or indirectly to marine waters or inland waters.

ENVIRONMENT: Means land, air, water organisms and ecosystems and includes:

- human-made or modified structures or area, and
- the amenity values of an area.

ENVIRONMENTAL HARM: the same as is defined in section 5 of the *Environment Protection Act 1993*. Any harm or potential harm, to the environment (of whatever degree or duration), and includes environmental nuisance.

ENVIRONMENTAL MONITORING PROGRAM: a program to be prepared and implemented by the licensee, which provides detailed descriptions of the methods to be used to gather data to inform management decisions aimed at minimising impacts to the environment. The monitoring program for dredging is to form part of the DMP. For the majority of dredging activities, a water quality monitoring program (WQMP) will be required.

ENVIRONMENTAL NUISANCE: as defined in section 3(1) of the *Environment Protection Act 1993*
environmental nuisance means—

a) any adverse effect on an amenity value of an area that—
   (i) is caused by pollution; and
   (ii) unreasonably interferes with or is likely to interfere unreasonably with the enjoyment of the area by persons occupying a place within, or lawfully resorting to, the area; or
b) any unsightly or offensive condition caused by pollution.

ENVIRONMENTAL VALUES: For the purposes of the *Environment Protection (Water Quality) Policy 2015*, waters may have one or more of the following environmental values:

a) aquatic ecosystems
b) recreation and aesthetics
c) drinking water for human consumption
d) primary industries – irrigation and general water uses
e) primary industries – livestock drinking water
f) primary industries – aquaculture and human consumption of aquatic foods.

GENERAL ENVIRONMENTAL DUTY: 'A person must not undertake an activity that pollutes, or might pollute, the environment unless the person takes all reasonable and practicable measures to prevent or minimise any resulting environmental harm' (section 25 of the *Environment Protection Act 1993*).

HAZARDOUS WASTE: includes any unwanted or discarded material which because of its physical, chemical or infectious characteristics can cause significant hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

IMPACT: environmental change that has occurred as a result of dredging.

INLAND WATERS: waterways or bodies of water in the state excluding any waters within the ebb and flow of the tide. Inland waters can include artificial bodies that have been created for public enjoyment but do not include floodplains or watercourses that are dry.

INTERTIDAL ZONE: any interface between the land and sea which is exposed during low tide and submerged at high tide.

LEACHATE: a liquid that has percolated through and/or been generated by decomposition of waste material. It includes water that comes in contact with waste and is potentially contaminated by nutrients, metals, salts and other soluble or suspended components and products of decomposition of the waste.

LICENSED WASTE DEPOT: waste depot licensed under Part 6 of the *Environment Protection Act 1993.*

MARINE MAMMAL OBSERVER (MMO): a person trained in marine mammal observation who informs management responses which minimise risks to marine mammals.

MARINE WATERS: the coastal waters of the state or any part of the sea that is within the limits of the state, and includes any estuary or tidal waters.

MEAN HIGH WATER MARK: the mean of all high tides including the spring and neap high tides taken over a long period of time.

ORGANIC MATTER: any living or dead animal and plant material. It includes living plant roots and animals, plant and animal remains at various stages of decomposition, and microorganisms and their excretions.

POLLUTANT: the same as specified in section 3 of the *Environment Protection Act 1993*

a) any solid, liquid or gas (or combination thereof) including waste, smoke, dust, fumes and odour; or
b) noise; or
c) heat; or
d) anything declared by regulation to be a pollutant for the purposes of this Act (following consultation by the Minister on the regulation with prescribed bodies in accordance with the regulations); or
e) anything declared by an environment protection policy to be a pollutant for the purposes of this Act,

but does not include anything declared by regulation or by an environment protection policy not to be a pollutant for the purposes of this Act.

POLLUTE: means the same as specified in section 3 of the *Environment Protection Act 1993*:

a) discharge, emit, deposit, dispose of or disturb pollutants; or
b) cause or fail to prevent the discharge, emission, depositing, disposal, disturbance or escape of pollutants.

SCHEDULE OF WORKS: timeline of the dredging and dewatering campaign inclusive of dates for mobilisation to site, construction of dewatering infrastructure, dredging, demobilisation, decommissioning, disposal and removal of all equipment and spoil from the approved locations.

SENSITIVE RECIEVER: as defined in *Evaluation distances for effective air quality and noise management*:

- any fixed location (including a house, building, other premises of open area) where:
  - human health may be affected by air emissions from existing or proposed development, and/or
  - property damage or loss of amenity may be caused by air emissions from the existing or proposed development and/or
  - noise-affected premises (whether existing or future, based on land-use zoning) that are in separate occupation from the existing or proposed noise source and used for residential or business purposes or constitutes a quiet ambient environment set aside for public recreation and enjoyment and/or
  - plants, animals or ecosystems that may be affected by air and/or noise emissions.

SPOIL: material obtained by dredging.

STORMWATER: rain or melted precipitation that runs off land or structures on land.

SUPERNATANT WATERS: the water from which solids that have settled have been removed.

SUITABLY QUALIFIED PERSON: a person who holds relevant qualifications or has demonstrated professional experience and expertise which encompasses an appropriate range of competencies.

TIDAL CYCLE: one high tide plus a successive low tide.

TOXICITY: degree of being poisonous or otherwise harmful to plant, animal or human life.

TRIGGERS, ALARM: triggers established to avoid non-compliance and the potential for environmental harm.

TRIGGERS, HOLD: represent the limit of acceptable impacts beyond which there is likely to be a significant effect on the environment.

TURBIDITY: the cloudiness in water caused by suspended material. Turbidity is often measured using nephelometric turbidity units (NTU).

WASTE: as defined in the *Environment Protection Act 1993*

a) any discarded, dumped, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or for purification or resource recovery by a separate operation from that which produced the matter; or
b) any matter declared by regulation (following consultation by the Minister on the regulation with prescribed bodies in accordance with the regulations) or by an environment protection policy to be waste; whether or not of value.

WATER: as defined in the *Environment Protection Act 1993*

a) water occurring naturally above or under the ground; or
b) water introduced to an aquifer or other area under the ground; or
c) an artificially created body of water or stream that is for public use or enjoyment.

WATERS: as defined for the *Environment Protection (Water Quality) Policy 2015*, includes all state waters (inland and marine), public stormwater systems or an irrigation channel and underground water.

WATERCOURSE: any of the following (whether or not temporarily wet or temporarily dry):

a) a river, creek or other natural watercourse (whether modified or not);
b) a lake, wetland, swamp, dam or reservoir or other body of water that collects water or through which water flows;
c) the Coorong;
d) an artificial channel;
e) a public stormwater disposal system; and includes part of a watercourse.

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Water quality	
Environment Protection (Water Quality) Policy 2015	EPA legislation relating to water quality.
Australian and New Zealand (ANZ) Guidelines for fresh and marine water quality 2018	Provides guidance for planning and managing water quality or sediment quality.
ANZ Guidelines Water quality Monitoring	Guidance on how to develop a water quality monitoring program.
ANZ Default Guideline Values	Provides default guideline values for environmental protection in Australia.
National Assessment Guidelines for Dredging 2009	National assessment framework for the disposal of spoil in the marine environment.
EPA Guideline: Bunding and spill management 2016	Provides information on bunds or spill containment systems to minimise the risk of environmental harm from liquid spills and leaks.
EPA Code of practice for vessel and facility management: marine and inland waters, 2008 (revised 2019)	Specifies EPA requirements for the operational management of inland and marine vessels including refuelling, maintenance, biofouling, bilge water and ballast water.
EPA Code of practice for material handling on wharves, 2006	Specifies EPA requirements for handling of materials on wharves.
EPA Guideline: Environmental management of dewatering during construction activities	Environmental management of dewatering during construction activities for site owners, developers, consultants and contractors.
Best Practice Erosion and Sediment Control (BPESC) International Erosion Control Association (IECA) Design Fact Sheets – Drainage, Erosion & Sediment control Dewatering; Instream flow Standard Drawings – Erosion, Sediment & Drainage control Dewatering; Instream practices.	Information about stormwater management.
WASMI Characterisation of dredge plumes	A suite of articles relating to research undertaken on the characterisation of dredge plumes.
Facts about Turbidity and Dredging (IADC).	Fact sheet from the International Association of Dredging Companies (IADC) regarding characterisation and management of dredging plumes during dredging.

Noise	
Environment Protection (Noise) Policy 2007	EPA legislation relating to noise.
Local Nuisance and Litter Control Act 2016	Regulation of local nuisance (dust, odour and noise) and littering which is administered by councils. Note: nuisance arising from EPA licensed activities is regulated by the EPA.
EPA Information Sheet: Construction noise 2017	Advice on managing excessive noise from building sites.
EPA Information Sheet: General environmental noise 2013	Information on the types of noise covered by legislation and lists the maximum noise levels permissible in specific circumstances.
EPA Guideline: Evaluation distances for effective air quality and noise management, 2016	Recommended evaluation distances from polluting activities, within which potential adverse impacts on sensitive receptors need to be assessed.
EPA Position Statement: Noise and the South Australian planning system	EPA's position on the assessment of noise for development proposals.
Underwater Piling Noise Guidelines DPTI 2012	Provides guidance on the management of noise while undertaking activities that involve piling.
DPTI Management of Noise and Vibration: Construction and Maintenance Activities DPTI 2017	Noise mitigation and consultation requirements for infrastructure works and maintenance to minimise the impact of work (particularly night work) on adjacent receivers.
Air Quality	
Environment Protection (Air Quality) Policy 2016	EPA legislation relating to air quality.
EPA Guideline: Ambient air quality assessment 2016	Outlines EPA information requirements that will facilitate the EPA's assessment of air quality impacts for a proposed development or activity.
EPA Guideline: Evaluation distances for effective air quality and noise management, 2019	Recommended evaluation distances from polluting activities, within which potential adverse impacts on sensitive receptors need to be assessed.
Waste	
Environment Protection (Waste to Resources) Policy 2010	EPA legislation relating to waste management.
EPA Guideline for stockpile management: Waste and waste derived products for recycling and reuse 2010 (updated 2019)	Outlines potential risks associated with the stockpiling of wastes and waste derived products and provides guidance on the appropriate and relevant controls to reduce those risks.

EPA Standard for the production and use of waste derived fill	Provides information required by the EPA to support the beneficial reuse of a range of wastes specifically recovered for use as fill.
Waste Derived Soil Enhancer Standard	Provides information required by the EPA to support the beneficial recycling of waste by its application to agricultural land as a soil enhancer.
Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil	Provides the current criteria for the classification of waste as they appear on EPA licences, including Industrial and Commercial Waste (Listed) and Waste Soil.
Hazardous Substances / Site Contamination	
EPA Guideline: Bunding and spill management 2016	Information on bunds or spill containment systems to minimise the risk of environmental harm from liquid spills and leaks.
EPA Code of practice for vessel and facility management: marine and inland waters, 2008 (revised 2019)	EPA requirements for the operational management of inland and marine vessels including refuelling and maintenance.
EPA Code of practice for material handling on wharves, 2006	EPA requirements for handling of materials on wharves.
Anti-fouling and In-water Cleaning Guidelines, 2015 (Commonwealth of Australia)	Best practice for applying, maintaining, removing and disposing of anti-fouling coatings.
EPA Guideline: Wastewater lagoon construction, 2014 (for contaminated spoil)	Advises those proposing to build wastewater lagoons on construction techniques that should assist in meeting EPA requirements.
EPA Guideline: Acid sulfate soil material, 2007	Information on the identification and management of acid sulfate soil materials including soil, sediment and rock).
ANZ Water Quality Guidelines – Acid Sulfate Soils	Guidance to help understand and manage the effect of acid sulfate soils on water quality.
ANZ Guidance for the dewatering of acid sulfate soils in shallow groundwater environments	Technical and practical advice on dewatering acid sulfate soils in shallow groundwater environments to help prevent or minimise harm to the environment.
ANZ Guidelines for the dredging of acid sulfate soil sediments and associated dredge spoil management	Provides technical and procedural advice to avoid environmental harm from acid sulfate soils encountered during dredging projects.
The University of Adelaide: The acid sulfate soils centre	Collection of information on the assessment and management of acid sulfate soils.
DPTI Guideline for the assessment of acid sulfate soils 2012	Instruction for the assessment and management of acid sulfate soils which may be disturbed during infrastructure construction projects or maintenance activities.
EPA Guideline Landfill disposal criteria for PFAS-contaminated waste 2020	Provides direction and guidance for the disposal of PFAS-contaminated waste in landfill facilities.

General Information	
Environment Protection Act 1993	Provides the regulatory framework to protect South Australia's environment, including land, air and water.
WAMSI Dredging Science Node 2019	Collation of information facilitated by the Western Australian Marine Science Institution (WAMSI) on the impacts and management of dredging.
Enviro Data SA	Information relating to the environment of SA.
Nature maps	Includes zoning, industry, land types, vegetation mapping etc.
Location maps	Maps for tide locations, industry, water courses, stormwater drains etc.
Biosecurity SA Aquatic Pests	Information on aquatic pests found in SA.
Biosecurity SA Aquatic Diseases	Information on aquatic diseases and legislative requirements.
International Maritime Organisation - Biofouling	Provide information on the global approach to the management of biofouling.
National biofouling management guidelines for non-trading vessels	Provides practical management options for operators of non-trading vessels for the management of biofouling hazards associated with vessels and equipment.
NSW Guideline: Extractive Industries Dredging and other Extraction in Riparian and Coastal Areas EIS Guidelines	NSW government guideline on the preparation of environmental impact statements for dredging.
QLD Guideline: Dredging and allocation of quarry material	Guidance on the approval process and assessment requirements for dredging activities (including the disposal of dredged material).
Victoria Guidelines for Dredging	Victorian EPA's advice on the environmental requirements for dredging in Victorian waters.
EPA Guidelines WA: Technical Guidance Environmental Impact Assessment of marine dredging proposals	Describes the impact prediction and assessment framework required by WA EPA for dredging proposals.
NT EPA: Guidelines for the Environmental Assessment of Marine Dredging in the Northern Territory	Provides information for those planning to dredge in the marine and estuarine waters of the Northern Territory.
Ports Australia: Dredging and Australian Ports (Subtropical and Tropical Ports)	Provides an overview of the approval processes associated with dredging and at-sea placement of dredged material, the nature of environmental monitoring programs associated with recent port related dredging projects.
International Association of Dredging Companies	Publications, webinars, seminars etc. relating to dredging activities.
Central Dredging Association (CEDA)	Publications, webinars, seminars etc. relating to dredging activities (under 'Resources').