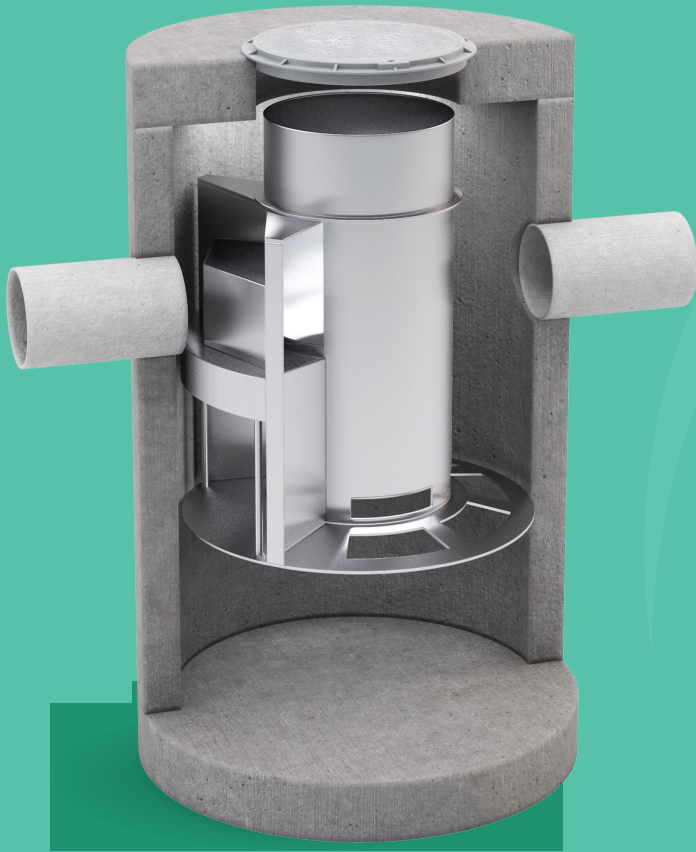
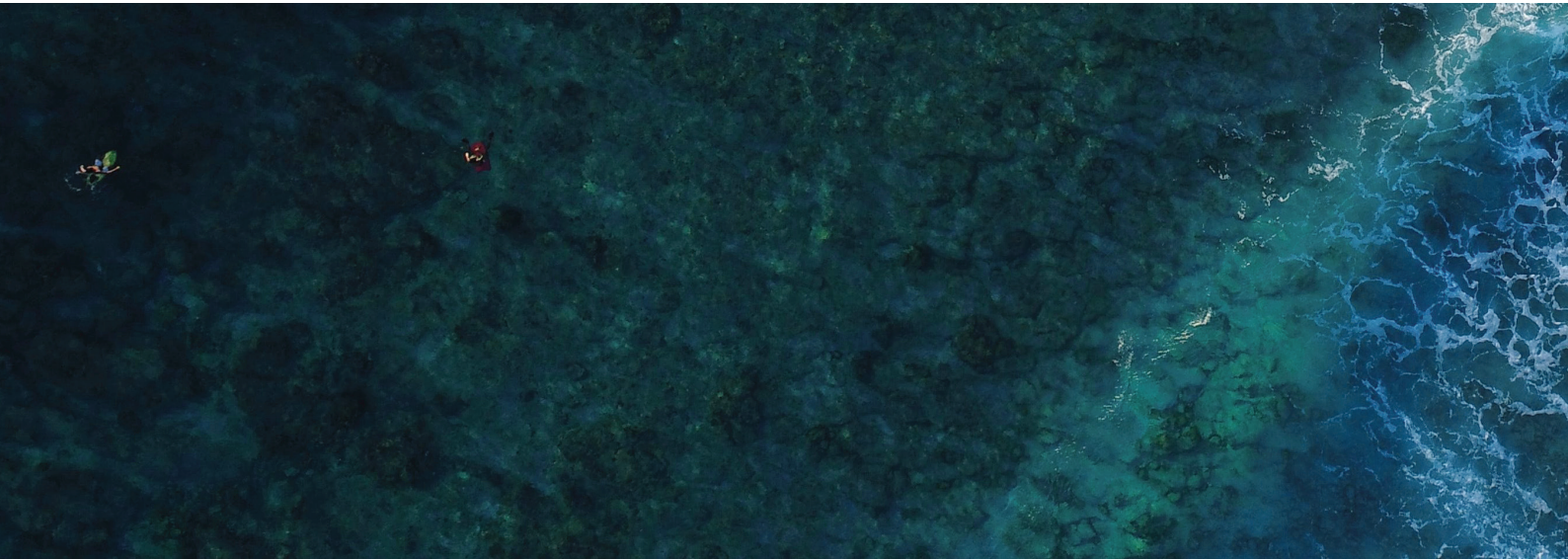


Cascade Separator[®]

Operations & Maintenance Manual



Stopping Pollution Entering Waterways



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Introduction

The primary purpose of stormwater treatment devices is to capture and prevent pollutants from entering waterways, maintenance is a critical component of ensuring the ongoing effectiveness of this process. The specific requirements and frequency for maintenance depends on the treatment device and pollutant load characteristics of each site. This manual has been designed to provide details on the cleaning and maintenance processes as recommended by the manufacturer.

The Cascade Separator® is a vortex type engineered stormwater management device designed to remove hydrocarbons and sediment with associated pollutants from stormwater runoff. It removes all particles 5 mm and greater from stormwater flows, including neutrally buoyant material such as rubbish and debris.

Why do I need to perform maintenance?

Adhering to the maintenance schedule of any stormwater treatment device is essential to ensuring that it works properly throughout its design life.

During each inspection and clean, details of the mass, volume and type of material that has been collected by the device should be recorded. This data will assist with the revision of future management plans and help determine maintenance interval frequency. It's also essential that qualified and experienced personnel carry out all maintenance (including inspections, recording and reporting) in a systematic manner.

Maintenance of your stormwater management system is essential to ensuring ongoing at-source control of stormwater pollution. Maintenance also helps prevent structural failures (e.g. prevents blocked outlets) and aesthetic failures (e.g. debris build up).

Health and Safety

Access to a Cascade Separator® unit requires removing heavy access covers/grates, additionally it might become necessary to enter into a confined space.

Pollutants collected by the Cascade Separator® will vary depending on the nature of your site. There is potential for these materials to be harmful. For example, sediments may contain heavy metals, carcinogenic substances or objects such as broken glass and syringes. For these reasons, all aspects of maintaining and cleaning your OceanSave require careful adherence to Occupational Health and Safety (OH&S) guidelines.

It is important to note that the same level of care needs to be taken to ensure the safety of non-work personnel, as a result it may be necessary to employ traffic/pedestrian control measures when the device is situated in, or near areas with high vehicular/pedestrian activity.

Personnel health and safety

Whilst performing maintenance on the Cascade Separator®, precautions should be taken in order to minimise (or when possible prevent) contact with sediment and other captured pollutants by maintenance personnel. In order to achieve this the following personal protective equipment (PPE) is recommended:

- Puncture resistant gloves
- Steel capped safety boots
- Long sleeve clothing, overalls or similar skin protection
- Eye protection
- High visibility clothing or vest

During maintenance activities it may be necessary to implement traffic control measures. Ocean Protect recommend that a separate site specific traffic control plan is implemented as required to meet the relevant governing authority guidelines.

Whilst the minor maintenance for the Cascade Separator® can be performed from surface level, there will be a need to enter the pit (confined space) during major services. It is recommended that all maintenance personnel evaluate their own needs for confined space entry and compliance with relevant industry regulations and guidelines. Ocean Protect maintenance personnel are fully trained and carry certification in confined space entry requirements.

How does it work?

The internal flow controls of the Cascade Separator® are illustrated in *Figure 1*. Low, frequently occurring storm flows enter the device via one or more inlet pipes, or a surface grate. Once inside the device, water is directed to two separate inlet flumes. As a result of the directional flow into the centre tube via the flumes, vortices are created operating in opposite directions. This innovative design unlike any other device on the market facilitates enhanced particle separation. The downward swirling vertical water column allows for sediment to settle into the sump and water to exit through an outlet window. Flow that eventually exceeds the capacity of the flumes can also exit over the flume without re-suspending

previously captured pollutants. The system incorporates a partially perforated slanted skirt that equalizes the pressure between the storage and treatment zone while reducing the potential for scour. The skirt also allows transport of sediment and debris into the sump zone which improves ease of maintenance since all captured material can be removed through the centre tube.

The outlet deck incorporates two drain down pipes that extend downward and allow the system to drain to the outlet pipe invert elevation after the storm event has subsided, while preventing captured hydrocarbons from leaving the system.

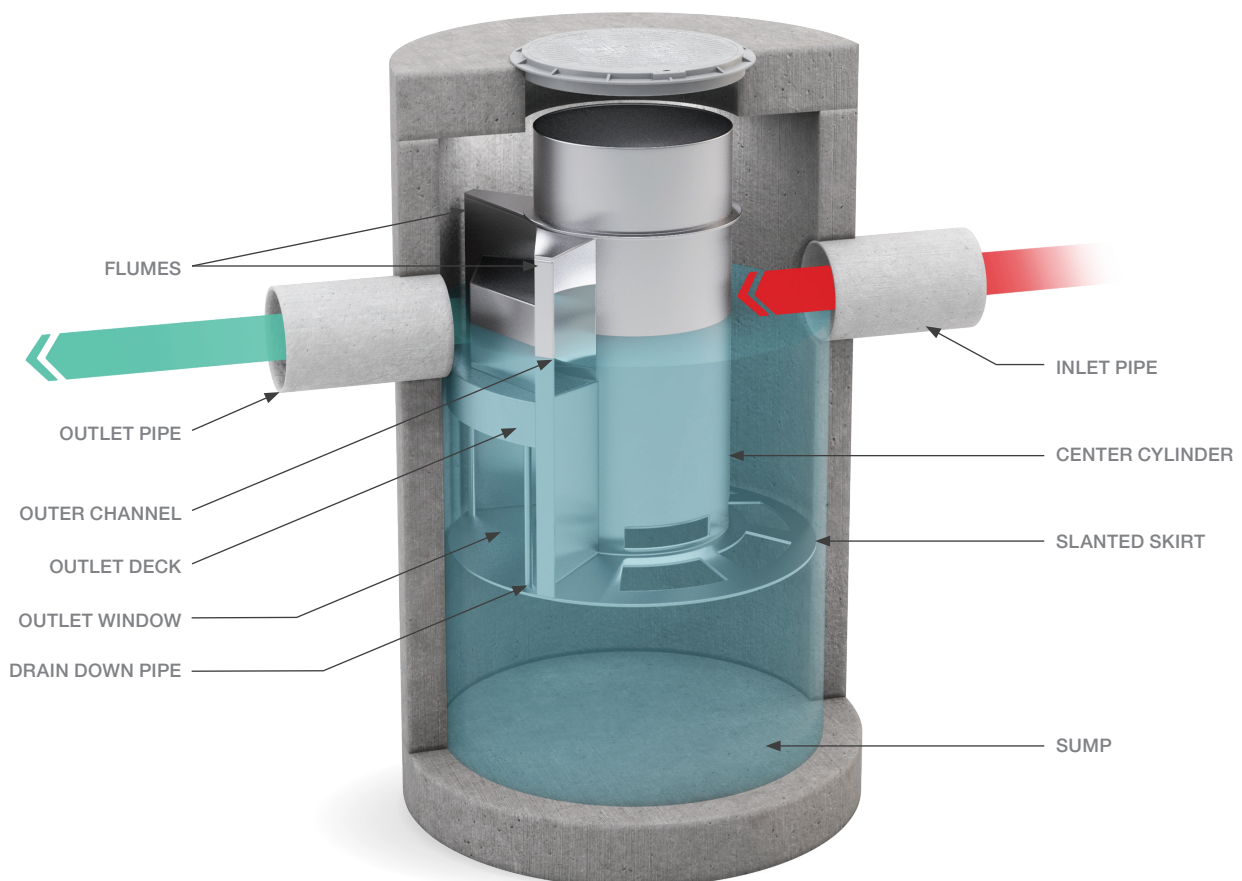


Figure 1: Cascade Separator® components

Maintenance Procedures

To ensure optimal performance, it is advisable that regular maintenance is performed. Typically, the Cascade Separator® requires a minor service every 6 months and a major service every 12 to 24 months.

Primary types of maintenance

The table below outlines the primary types of maintenance activities that typically take place as part of an ongoing maintenance schedule for the Cascade Separator®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Visual inspection of internals Removal of larger pollutants at the inlet bay Measuring of sediment depth	At 6 Months
Major Service	Removal of accumulated sediment and gross pollutants	At 12 Months

Maintenance requirements and frequencies are dependent on the pollutant load characteristics of each site. The frequencies provided in this document represent what the manufacturer considers to be best practice to ensure the continuing operation of the device is in line with the original design specification.

Minor Service

This service is designed to assess the condition of the device and record necessary information that will inform the activities to be undertaken during a major service.

- 1 Establish a safe working area around the access point
- 2 Remove access cover
- 3 Visually inspect the inlet chamber
- 4 Remove large floatable pollutants with a net
- 5 Measure and record sediment depth
- 6 Replace access cover

Major Service

This service is designed to return the Cascade Separator® device back to optimal operating performance.

- 1 Establish a safe working area around the access point
- 2 Remove access cover
- 3 Using a vacuum unit remove any floatable pollutants
- 4 Decant water until water level reaches accumulated sediment
- 5 Remove accumulated sediment and gross pollutants with vacuum unit (if required)
- 6 Use high pressure water to clean flumes, centre tube and sump area (if required)
- 7 Replace access cover

When determining the need to remove accumulated sediment from the Cascade Separator® unit, the specific sediment storage capacity for the size of unit should be considered (see table below).

Model	Diameter (m)	Sediment Storage Capacity (m³)	Oil Storage Capacity (litre)
CS1200	1.2	0.5	530
CS1500	1.5	0.8	1040
CS2250	2.25	2.4	4270
CS3250	3.25	4.4	8340

Additional Types of Maintenance

The standard maintenance approach is designed to work towards keeping the Cascade Separator® system operational during normal conditions. From time to time events on site can make it necessary to perform additional maintenance to ensure the continuing performance of the device.

Hazardous Material Spill

If there is a spill event on site, the Cascade Separator® unit that potentially received flow should be inspected and cleaned. Specifically all captured pollutants from within the unit should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event.

Blockages

The Cascade Separator® internal high flow bypass functionality is designed to minimise the potential of blockages/flooding. In the unlikely event that flooding occurs around or upstream of the device location the following steps should be undertaken to assist in diagnosing the issue and determining the appropriate response.

- 1 Inspect the inlet aperture, ensuring that it is free of debris and pollutants
- 2 Decant water from Cascade Separator® unit in preparation for confined space entry
- 3 Inspect the screen and flume as well as both inlet and outlet pipes for obstructions, if present remove any built up pollutants or blockages

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the Cascade Separator® after a significant major storm event. The focus is to inspect for higher than normal sediment accumulation that may result from localised erosion, where necessary accumulated pollutants should be removed and disposed.

Disposal of Waste Materials

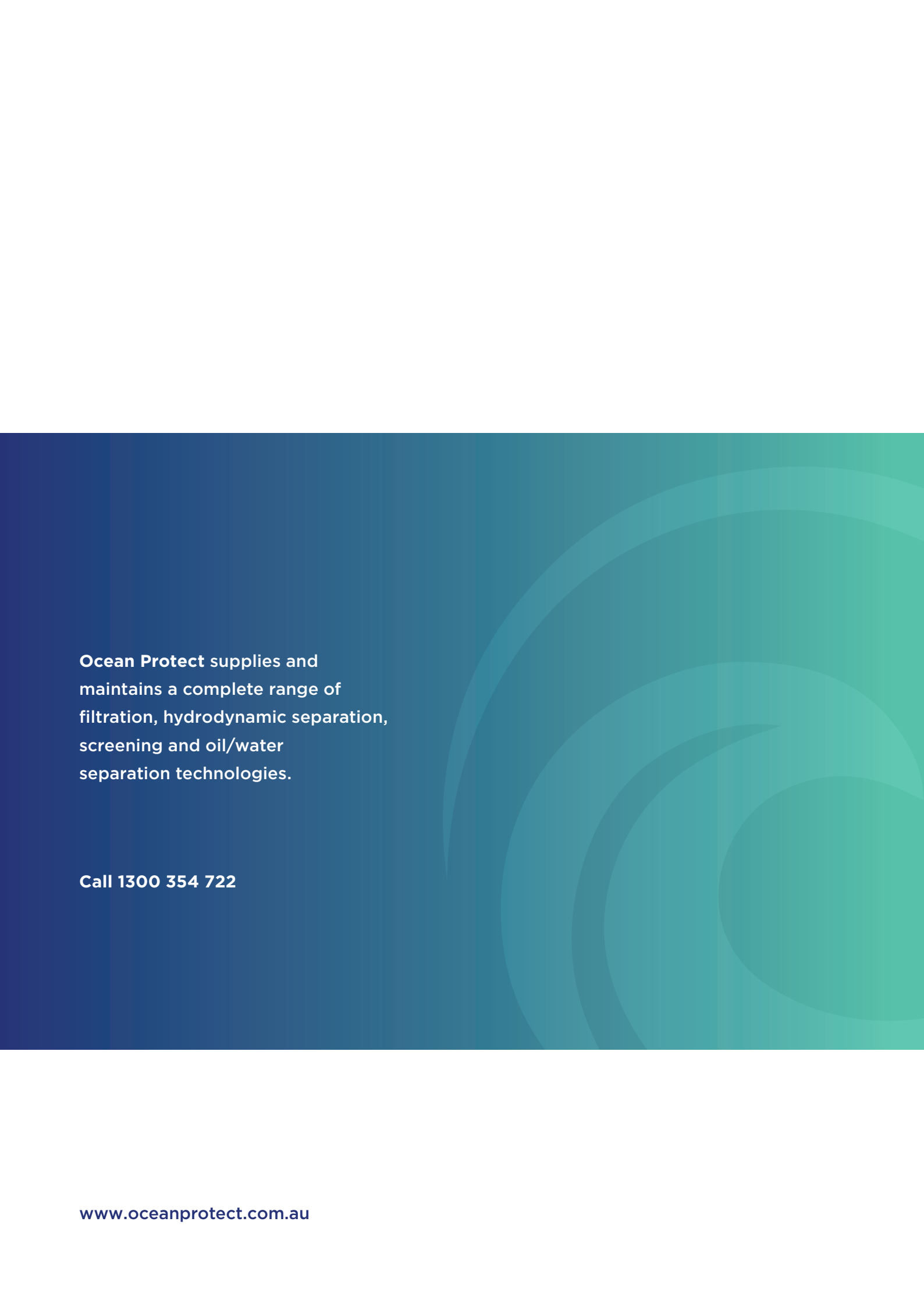
The accumulated pollutants found in the Cascade Separator® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the system has been exposed to any hazardous or unusual substance, there may be additional special handling and disposal methods required to comply with relevant government/authority/industry regulations.

Maintenance Services

With over a decade and a half of maintenance experience, Ocean Protect has developed a systematic approach to inspecting, cleaning and maintaining a wide variety of stormwater treatment devices. Our fully trained and professional staff are familiar with the characteristics of each type of system, and the processes required to ensure its optimal performance.

Ocean Protect has several stormwater maintenance service options available to help ensure that your stormwater device functions properly throughout its design life. In the case of the Cascade Separator® we offer long term pay-as-you-go contracts and pre-paid once off servicing.

For more information please visit
www.oceanprotect.com.au



Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

Call 1300 354 722