

Soil Water Management Plan

Port Kembla Bulk Liquids Tanks Repurposing

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1. Introduction

1.1 Scope

SMEC has been commissioned by GrainCorp Operations Limited to undertake the Soil and Water Management Plan for the repurposing of the GrainCorp Bulk Liquid Terminal at Port Kembla. This SWMP outlines the design criteria, design philosophy and design decisions adopted for the soil and water management work for the Project.

The key design considerations associated with soil and water management during the operational stage include:

- Soil erosion risks;
- Flood immunity;
- Surface water and groundwater quality impacts; and
- Runoff volume and hydrologic changes.

1.2 Purpose of this Report

The purpose of this report is to:

- Provide an overview of the design assumptions made for the soil and water management on the Project.
- Document the design decisions considering functionality, expectations, demands, constraints, risks, and best value.
- Provide a historical record for reference of the design.

This report will focus on:

- Assessment of potential impacts to soil, surface water, and groundwater (both quality and quantity) during the construction and operational phases of the development; and
- Development of appropriate mitigation, management, and monitoring measures for soil, surface water, and groundwater in accordance with relevant guidelines.

2. Guidelines / Reference Documents

This SWMP has been prepared in accordance with local requirements and industry best practice guidelines shown in Table 1.

Table 1: List of Reference Documents

Title / Description	Author / Publisher	Version / Date
DPHI Letter to GrainCorp - SEE Content	Department of Planning, Housing and Infrastructure	11 June 2025
GrainCorp – Port Kembla Bulk Liquids Terminal Repurposing Concept Arrangement (20240704SK-001)	Beca / Graincorp	30 April 2025 / 17 September 2025
Waste Classification – Proposed Bulk Liquid Storage Terminal, Tom Thumb Road, Port Kembla, NSW	Coffey	25 October 2013
Liquid Terminals Port Kembla Proposed Development Drawings	GrainCorp	2014
Pacific Terminals Geotechnical Investigation Proposed Bulk Liquid Storage Terminal	Coffey	13 November 2013
Allans Creek Flood Study	Advisian	July 2019
Water Sensitive Urban Design (WSUD) Guidebook for Developers	Wollongong City Council	2025
Queensland Urban Drainage Manual (QUDM)	QLD Government	4th Edition
Australian Rainfall and Runoff (AR&R)	IE Australia	version 4.2, 2024
Best Practice Erosion and Sedimentation Control	International Erosion Control Association (IECA)	June 2008
Managing Urban Stormwater – Soils and construction, Volume 1, (“Bluebook”)	Landcom	4th Edition, March 2004
Urban Stormwater – Best Practice Environmental Management Guidelines	CSIRO	2006
Erosion and Sediment Control – A Field guide for Construction Site Managers	Catchment & Creeks	Version 2, 2010

3. Project Description

GrainCorp currently provide storage and handling of mineral oils at the Bulk Liquids Terminal (BLT) but are now considering the feasibility of repurposing of this facility to store and handle Tallow and Used Cooking Oil (UCO) (and possibly similar products). This will require new functionality such as product heating and modified product reticulation. Additionally, the introduction of export capability to the BLT is included.

The Bulk Liquids Terminal is located at Tom Thumb Road Port Kembla NSW 2505 on DP1046295 Lot 20. A rail line is located to the north. Gurungaty Waterway is located to the east of the site. Further east is the Tasman Sea.



Figure 1: Project Extents (Basemap from Wollongong City Council Planning & Environment Map, accessed 30/07/2025)

Works have been undertaken in 2014. Drawings showing these works are attached in Appendix A. An aerial image of the existing site is shown in Figure 2.

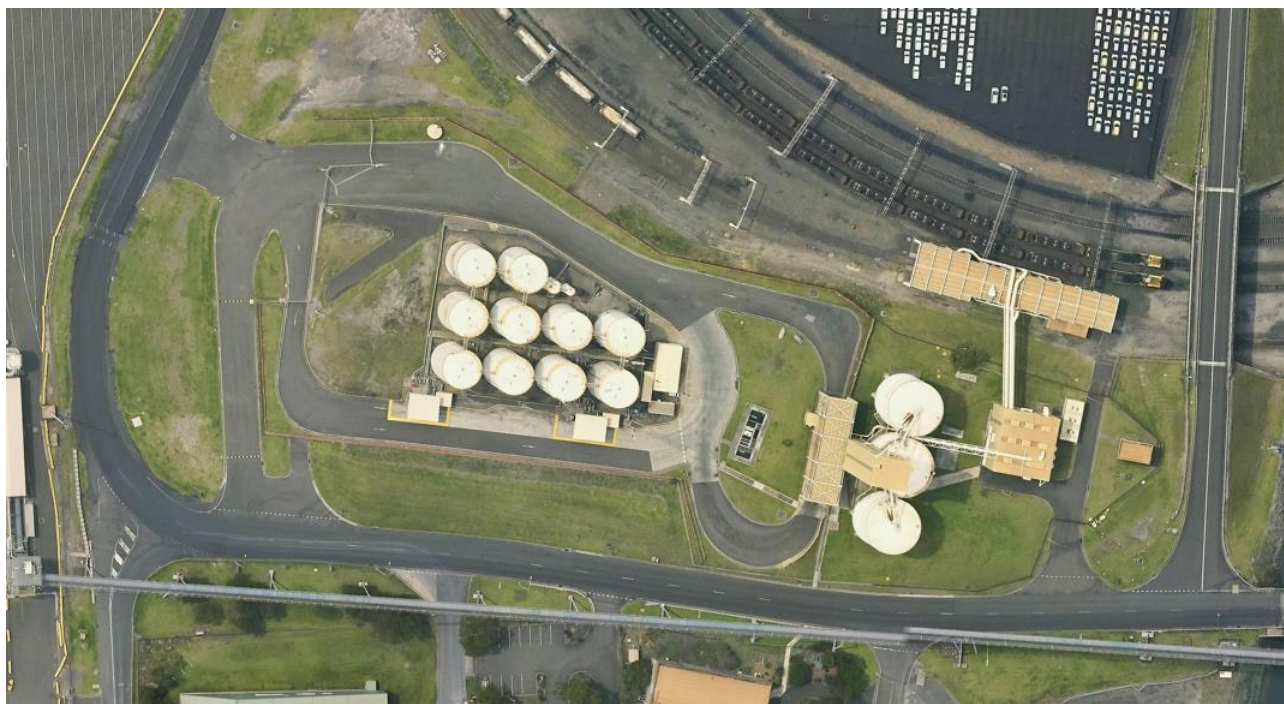


Figure 2: Aerial image of existing works (Source: Metromap, accessed 31/07/2025)

The works to support the GrainCorp Bulk Liquid Terminal repurposing is likely to involve:

- Minor earthworks to build a foundation for the proposed oil receipt pre-treatment, wash water treatment tanks and bulk storage tanks in the west of the site (for the repurposing works and Stage 2B works). This is likely to create additional impervious area and may have minor stormwater quality and quantity impacts over the construction and operation phase.
- The construction of a new hot water tank and heat exchanger. This is unlikely to have any stormwater quality or quantity impacts as it is already located on the existing hardstand.
- The construction of a new site lab. This is unlikely to have any stormwater quality or quantity impacts as it is already located on the existing hardstand.
- Repurposing the existing slops tank and diesel tank for diesel storage and slops tank. This is unlikely to have any stormwater quality or quantity impacts as it is already located on the existing bunded hardstand area.
- Upgrading boilers in the boiler house. This is unlikely to have any stormwater quality or quantity impacts as the boiler house is existing and is located on hardstand.

The location of these works is shown in Figure 3. A clearer version of Figure 3 is included in Appendix B.

4. Site Description and Constraint Assessment

4.1 Existing Drainage

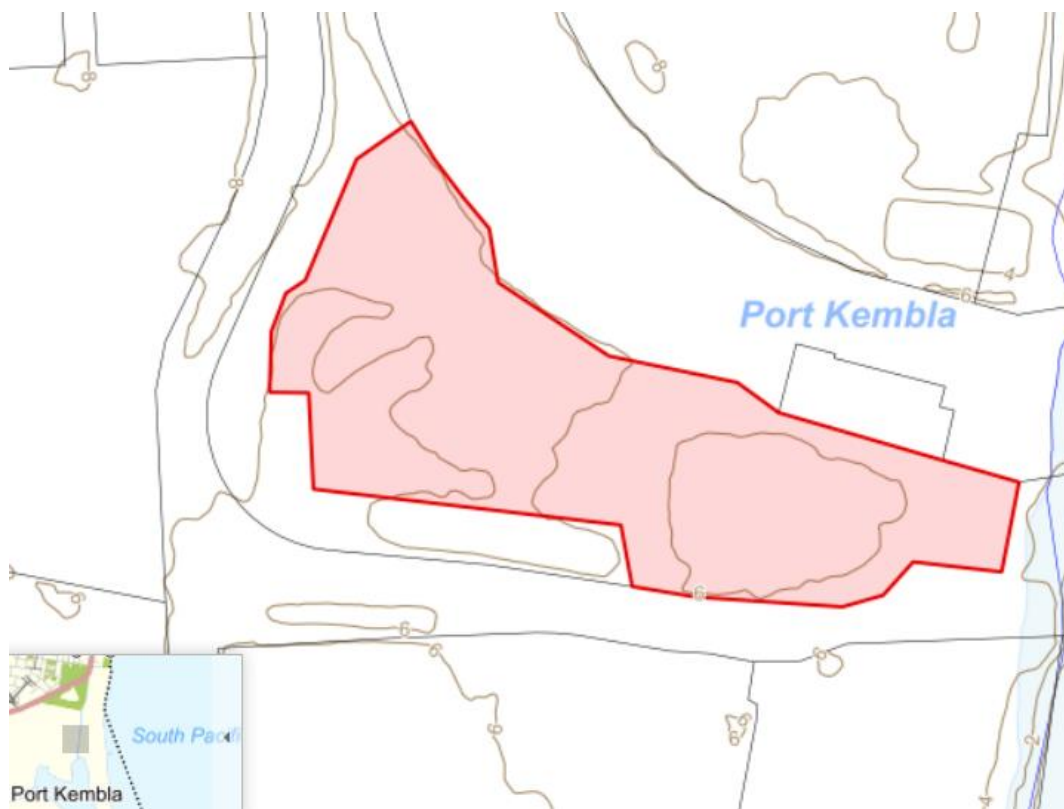


Figure 4: Site Contours (Source: Wollongong City Council Planning & Environment Map, accessed 30/07/2025)

Overland flows generally fall towards the east. Flows external to the site are generally captured by the road drainage system on the local access road and Tom Thumb Road. These do not drain to the pits near the oil tanks as these catchments are bounded by a bund to ensure water contaminated by oils (and thus needs to be treated by the oil water separator) is not mixed with water that does not need to be treated by the oil water separator.

Flows within the site are captured in the site's existing drainage system. The hardstand on which the existing oil tanks are located are bounded by a bund to ensure flows within that area are directed to the internal pits which connect to an oil-water separator. The site's existing drainage system is shown in purple in Figure 5. The full plan is shown in Appendix A. SMEC notes that this scope of works does not entail any upgrades to the drainage system as it has already been future-proofed as shown by the proposed pits P-01 and P-02.

The drainage system is generally directed to the east, flowing into an in-ground oil water treatment system with a capacity of 90m³/hour. This is detailed in Appendix A. This then drains to the site's pit (P-08) which then flows into a 375-diameter pipe which joins the drainage system at Tom Thumb Road.

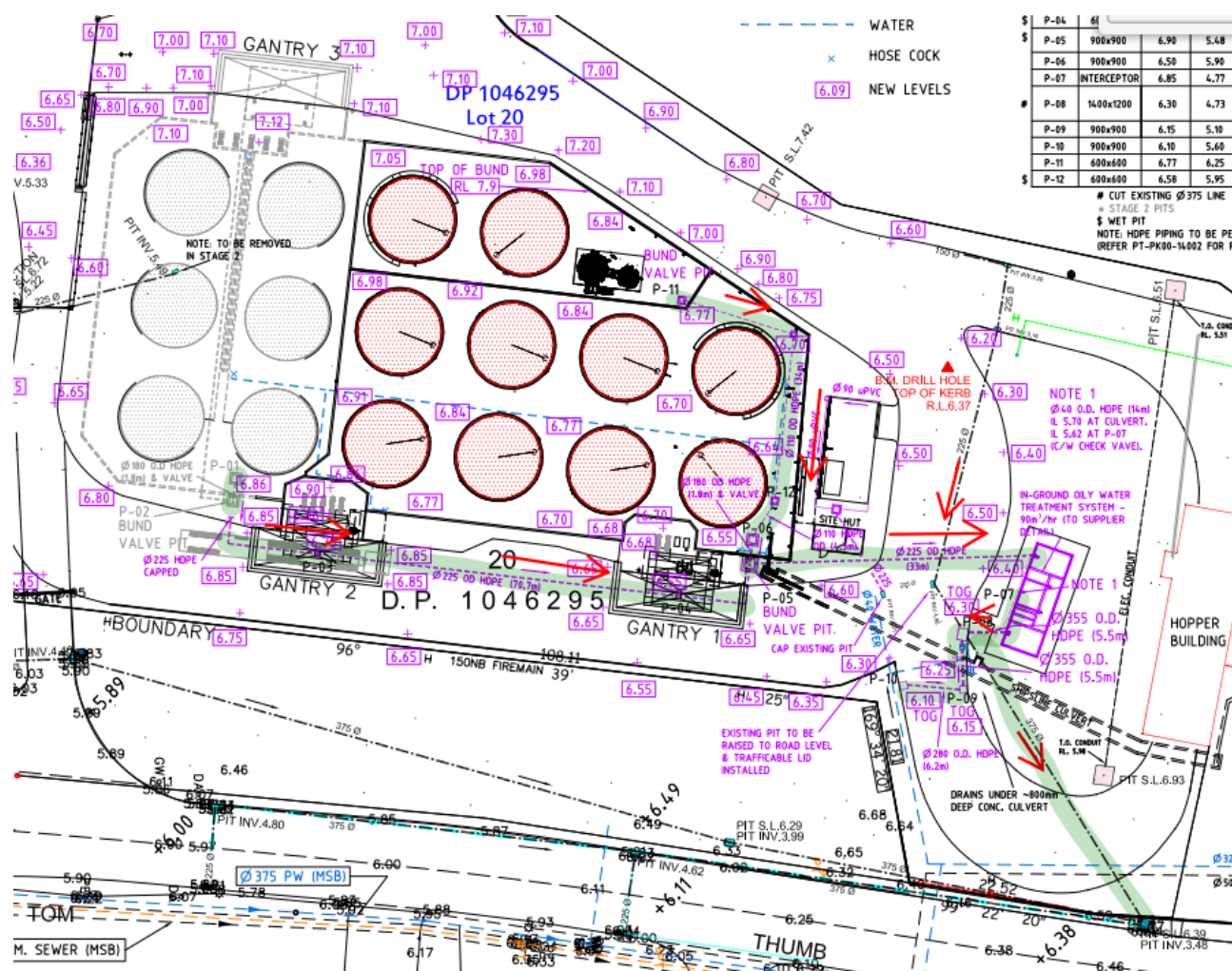


Figure 5: Site Existing Drainage System (Source: GrainCorp Liquid Terminals Port Kembla Proposed Development Drainage Plan, 19/08/2014)

4.2 Flood Immunity

4.2.1 Localised Flooding

The extent of works is described in Section 3. Works that are likely to create additional impervious area and have water quantity impacts over the operational phase are:

- Minor earthworks to build a foundation for the proposed oil receive pre-treatment, bulk storage tanks and wash water treatment tanks in the west of the site.

Appropriate localised drainage measures should be incorporated into the design where additional impervious area is created to manage surface runoff. This is to be undertaken with the construction of the proposed pits P-01 and P-02 and connected pipes (see Figure 5).

4.2.2 Regional Flooding

SMEC has reviewed the Allans Creek Flood Study undertaken by Advisian in 2019. SMEC has reviewed the 1% Annual Exceedance Probability (AEP) peak flood depths and levels for the Project Site. Tom Thumb Road, to the south of the Project Site, is affected by the 1% AEP event. Generally, the Project Site itself is free from flooding with the exception of the access road connecting Tom Thumb Road to the internal road network of the Project Site as shown in Figure 6. This is outside of the extent of the proposed works.

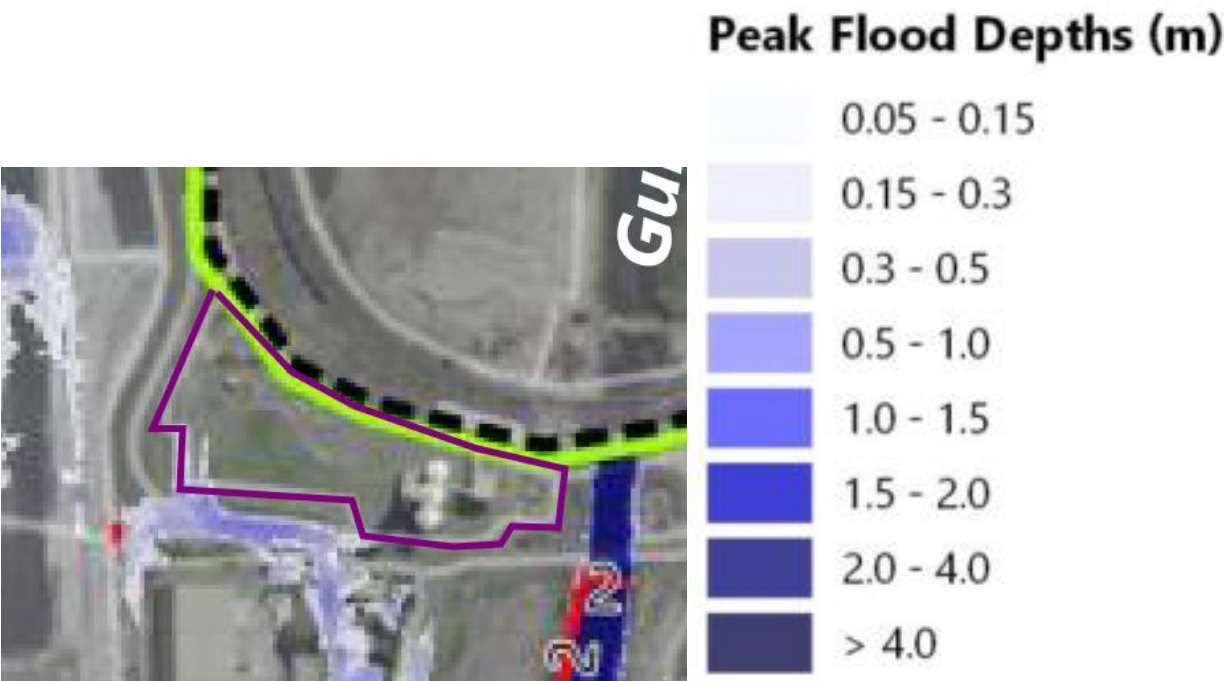


Figure 6: 1% AEP Event Peak Flood Depths and Levels for Project Site (Source: Advisian, 2019)

However, it should be noted that whilst the Allans Creek Flood Study was undertaken in 2019, 2013 LiDAR DEM was adopted as the base topographic data set for this study. The previous works on this site was undertaken in 2014 and it is likely the mound was removed, resulting in lower levels throughout the centre of the site. However, the mound is generally located outside of the flood extents (see Figure 8).

SMEC has requested from Wollongong City Council Flood Level Information Advice application for Grain Terminal Tom Thumb Road PORT KEMBLA NSW 2505. The site is generally unaffected by the PMF (probable maximum flood) as shown in Figure 7

Figure 7: PMF Flood Heights

(the works proposed for repurposing and Stage 2B are wholly outside of the PMF flood extent). As such, the proposed works will not worsen any flooding impacts.

The full Wollongong City Council Flood Level Information Advice is provided in Appendix C.

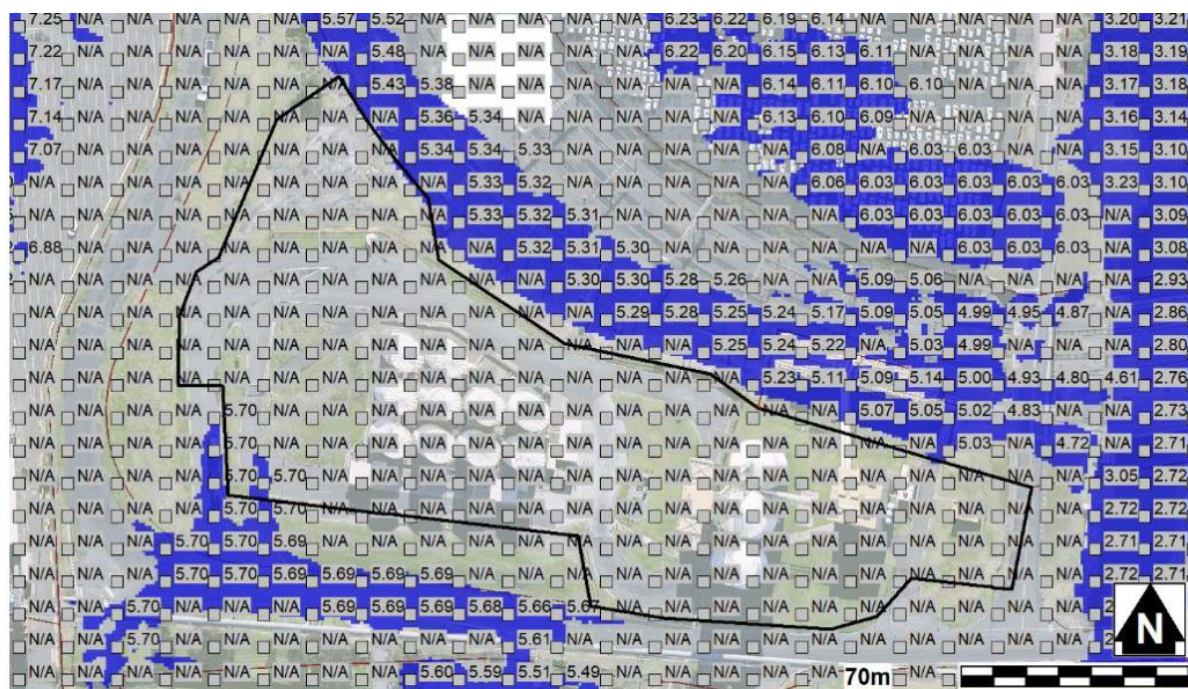


Figure 7: PMF Flood Heights

4.2.3 Flood Impact and Risk Assessment

The NSW Government recommends a fit for purpose flood impact and risk assessment (FIRA) for new developments.

The aim of a FIRA is to support a development proposal which may alter flood behaviour or introduce additional flood risk. Based off the Wollongong City Council Flood Level Information Advice, SMEC has used a DRAINS model instead of flood model to assess water quantity impacts as this is a small urban site with a defined drainage network and no floodplain interaction (as the extent of works is outside of the PMF). As such, SMEC notes that this development is unlikely to alter flood behaviour or introduce additional flood risk as shown by the DRAINS model and in line with the “Flood risk management guideline LU01 – Flood Impact and Risk Assessment (2023)”. This analysis is discussed in Section 6.1.

4.3 Soils Classification

Coffey has undertaken a Geotechnical Investigation for the Proposed Bulk Liquid Storage Terminal works in 2013 (this is for the same location for a previous scope of works and not specifically the repurposing works this report covers).

Over the central and southern portions of the site there is a fill mound. This is indicated in green in Figure 8.

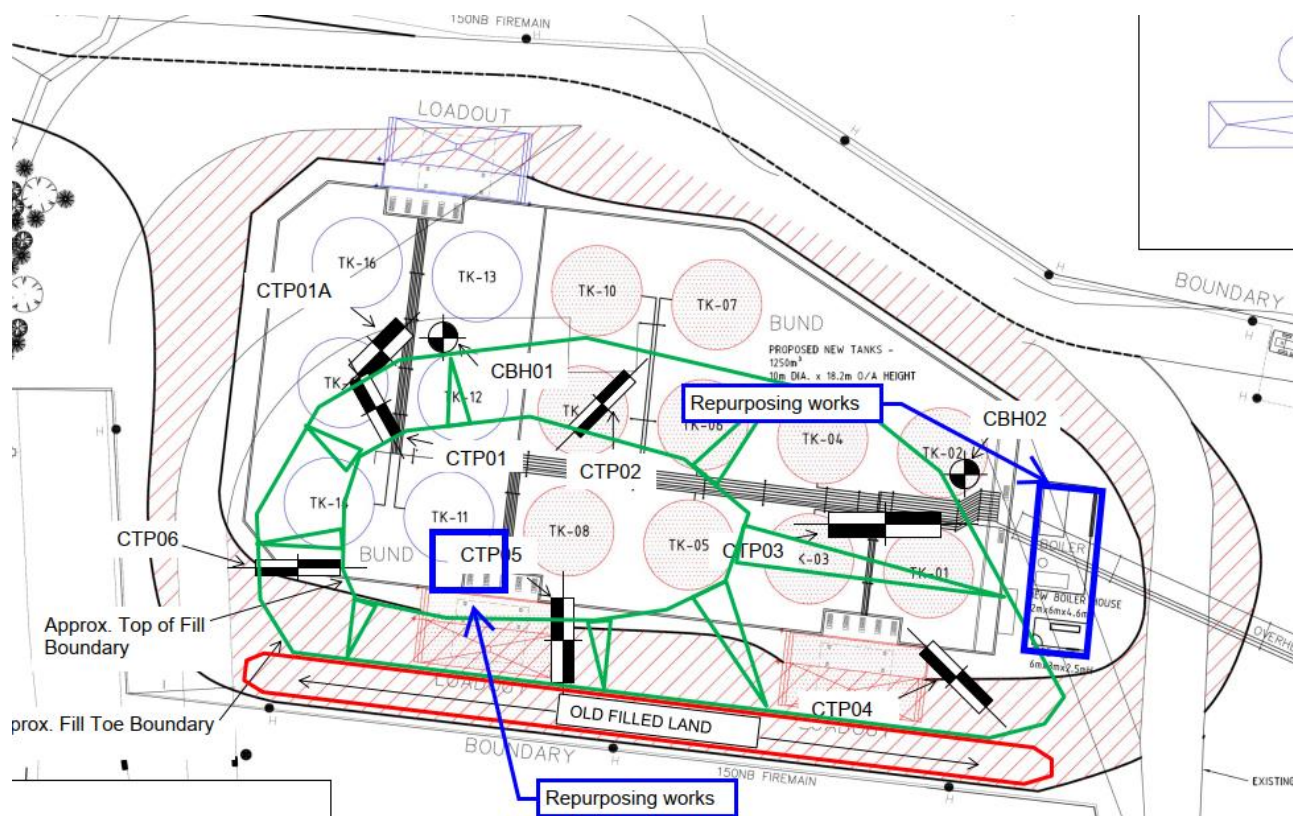


Figure 8: General Location of Fill Mound (Source: Coffey Geotechnical Investigation Site Plan with SMEC markups in blue, 2013)

Gravelly clayey sand was encountered on the surface of the test pits within the fill mound footprint. As part of the works for the previous stage, it is understood that the fill mound is removed and not reused as fill. In the Geotechnical Investigation, it was assumed that 0.5m to 1.0m of good-quality fill was to be placed to support platforms and concrete slabs. SMEC has reviewed publicly available ELVIS LIDAR data. LIDAR data was taken in 2013 (before the construction of the previous works in 2014) and in 2021 (after the 2014 works were completed). It can be seen that the mound has been removed based off LIDAR data.



Figure 9: Comparison of 2013 and 2021 LIDAR over Project Site

Clayey sand/gravelly sandy clay was encountered on the surface of the test pits outside of the fill mound footprint. It is likely that this is representative of the condition of the surface soil of the site.

4.4 Erosion Potential

SMEC has reviewed Geotechnical Investigation for the Proposed Bulk Liquid Storage Terminal works undertaken by Coffey as discussed in Section 4.3.

Clayey sand / gravelly sandy clay are considered representative of the condition of the surface soil of the site. Emerson class testing was not undertaken. However, SMEC has reviewed the K-factor (numeric representation of the ability of soils to resist the erosive energy of rain) of these soils based of Best Practice Erosion and Sedimentation Control (IECA, 2008). Clayey sand / gravelly sandy clay have a K-factor of 0.025 and 0.017 respectively. These K-values are generally low. As such, the site will have relatively low soil loss and SMEC will propose construction stage erosion and sediment controls accordingly.

5. Construction Stage Soil and Water Impacts

The key potential impacts that may arise during construction stage relating to surface water quality include:

- Erosion of the site during vegetation clearing, earthworks or other construction activities; and
- Transport of sediments or contaminants from the site into the existing drainage system and the Gurungaty Waterway (which is connected to Tom Thumb Lagoon and the Tasman Sea).

Works that are likely to create **erosion** and sediment impacts over the construction phase are:

- Minor earthworks to build a foundation for the proposed oil receipt pre-treatment, bulk storage tanks and wash water treatment tanks in the west of the site (repurposing works and future Stage 2B works).

A concept erosion and sediment control plan has been prepared in this report. During construction, the contractor will need to prepare a progressive erosion and sediment control plan.

5.1 Erosion Hazard Assessment

An erosion hazard assessment was carried out in accordance with Appendix E, IECA (2008). Based on the calculated soil loss, the level of sediment control, the stabilisation and staging required for the Project was determined. The calculation of the predicted annual average soil loss was carried out using the Revised Universal Soil Loss Equation (RUSLE) as follows:

$$A = R \times K \times LS \times P \times C$$

Equation 1 (IECA, (2008))

Where,

A = computed soil loss (tonnes/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length/gradient factor

P = erosion control practice factor

C = ground cover and management factor.

5.1.1 R-Rainfall Erosivity Factor

The rainfall erosivity factor, R, is a measure of the ability of rainfall to cause erosion. Rosewell and Turner (1992) have identified a strong correlation between the R-factor and the 2-year Average Recurrence Interval (ARI), 6-hour storm event (Landcom, 2004).

The R factor was calculated as per Appendix E of IECA (2008).

$$R = 164.74 * (1.1177)^S * S^{0.6444} \quad \text{Equation 2 (Appendix A, Landcom, (2004))}$$

Where,

S = the rainfall intensity associated with 2-year ARI, 6-hour ARI rainfall event (Rosewell and Turner, 1992)

For the Project, S was obtained from the BOM website.

S = 11.97mm/hr

R = 3088

5.1.2 K- Soil Erodibility Factor

The soil erodibility factor, K, is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Soil texture is the principal component affecting K, but soil structure, organic matter and profile permeability also contribute. In the RUSLE, it is a quantitative value experimentally determined (Landcom, 2004).

The soils found on site are discussed in Section 4.4 Clayey sand/Gravelly Sandy CLAY have a K-factor of 0.025 and 0.017 respectively. SMEC has used the more conservative value of 0.025.

5.1.3 LS - Slope Length/Gradient Factor

The slope length–gradient factor, LS, describes the combined effect of slope length and slope gradient on soil loss. It is the ratio of soil loss per unit area at any particular site to the corresponding loss from a specific experimental plot of known length and gradient (Landcom, 2004).

Gradients and slope lengths are varied across the Project. A slope length of up to 80 metres was considered for all catchments, as flow usually channelises past these lengths. The gradient of each catchment was calculated and used to calculate the resulting LS factor using the LS matrix. Table 2 below:

Table 2: Catchment Gradients, Lengths and LS Factors

Catchment ID	Slope	Length	LS
	%	m	
RP-01	3	11	0.24
2B-01	4	80	0.91

5.1.4 P - Erosion Control Practice Factor

The erosion control practice factor, P, is the ratio of soil loss with a nominated surface condition ploughed up and down the slope. It is reduced by practices that reduce both the velocity of runoff and the tendency of runoff to flow directly downhill (Landcom, 2004).

A conservative value of 1.3 was adopted for the P factor as recommended for construction phase conditions (Appendix E11, IECA 2008).

5.1.5 C - Ground Cover and Management Factor

The cover factor, C, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. The C-factor is different from the runoff coefficient used in hydrologic calculations. The most effective method of reducing the C-factor is maintenance, or formation of a good ground cover such as outlined in Appendix E, IECA 2008.

Given that this is during the construction stage, where a significant amount of earthworks is planned across the catchments, a conservative C Factor of 1 (fully disturbed) has been assumed.

5.1.6 A - Predicted Soil Loss

The predicted soil loss was computed as per RUSLE (Appendix E, IECA 2008). Table 3 detail the RUSLE equation and the values used in assessing erosion hazards.

Based on calculations carried out as per IECA 2008 guideline, Erosion Hazard is Very Low and Type 3 treatment measures (such as sediment fences, some stormwater inlet protection systems and straw bales) can be used. This is shown in Table 3.

Table 3: Soil Loss Assessment of Partially Disturbed Catchments

Catchment No.	Catchment ID	Catchment Size	K Factor	Ls	C Factor	Soil Loss Rate (t/ha/yr)	Soil Erosion Hazard
		Area (m ²)					
1	RP-01	180	0.025	0.24	1	24	Very Low
2	2B-01	1200	0.025	0.91	1	91	Very Low

5.2 Drainage, Erosion and Sediment Control Measures

Erosion, sediment, and drainage control are all essential to managing the construction of the Project in an environmentally sustainable manner.

5.2.1 Drainage Control Measures

Limited drainage control measures are required for external catchment as water from external catchments are generally already diverted from the construction site by existing bunds.

‘Dirty’ runoff generated within the area of works will be treated as shown in Appendix D and diverted to the existing drainage network.

5.2.2 Erosion Control Measures

Actions to be undertaken include:

- The contractor shall design, construct and install erosion and sediment control measures prior to breaking ground on the Project site.
- Dust generation associated with wind erosion can be controlled by techniques such as maintaining moist soil conditions (through the use of water trucks and sprinkler systems) and placing chemical sealants over the ground surface (dust palliatives).

The erosion control measures are to be applied in accordance with IECA Best Practice Erosion and Sediment Control.

5.2.3 Sediment Control Measures

Sediment control measures are proposed to intercept sediment-laden runoff and retain most sediments and other materials, thereby protecting downstream waterways from pollution (Landcom, 2004).

During construction, it is necessary to convey all water from partially disturbed catchments to go through a minimum of one Type 3 control (see Table 4). This ensures that the treated water leaving from the Project Site will be clean enough to discharge to the existing drainage system.

Table 4: Minimum Sediment Control Standards Based on Soil Loss (Source: Table 4.5.2 Extract (IECA 2008))

Control Type	Default/Example Treatment Measure
Type 1	Sediment basins
Type 2	Filter tube dam, rock filter dam, sediment weir, compost mulch berm,
Type 3	Sediment Fences, inlet protection

5.2.1 Proposed Sediment Control Devices

A rigorous optioneering assessment has been undertaken to identify economical, constructible, and economical sediment control devices.

5.2.1.1 Sediment Fences

Sediment fences are temporary barriers used on construction sites to prevent sediment-laden water from leaving the site and entering waterways, thus protecting water quality and preventing pollution.

5.2.2 Typical Details of Proposed Erosion and Sediment Control Measures

Reference is made to Book 6 of the IECA Handbook (2008) which outlines relevant A4 standard drawings of various ESC techniques. The standard drawings consist of diagrams displaying typical installation layout and dimensions and specifications for the materials, installation, maintenance and removal. Adherence to specific standard drawings include but are not necessarily limited to the following:

- SF-01 Sediment Fence
- SF-02 Sediment Fence

5.2.3 Soil and Stockpile Management

Soil and stockpile management is a key component of effective erosion and sediment control. Accordingly, the following actions are to be undertaken in accordance with pages 5.28, 5.29, Table 6.2, Table 6.3 of Book1 IECA 2008 and Appendix C IECA 2008.

Stockpiles shall be placed outside the 2-year ARI flood extent to prevent sediment displacement from flood water. Sediment fences shall be required downstream of each stockpile.

5.2.3.1 Topsoil Management

The topsoil management is to be carried out following pages 5.28, 5.29 of Table 6.2 Book 1 IECA 2008:

- The topsoil is managed (i.e. stripped, treated, stockpiled and reused) in accordance with the recommendations of an approved vegetation management plan or similar. Topsoil originating from the site is respread as the topsoil to maximise erosion control and revegetation, except where it has been assessed that such soil will not improve erosion control and/or vegetation on the site.

All reasonable and practicable measures must be taken to obtain the maximum benefit from existing non-dispersive topsoil, including:

- As the proposed area of soil disturbance exceeds 2500 m², and the topsoil does not contain undesirable weed seed, the top 50 mm of soil must be stripped and stockpiled separately from the remaining topsoil and spread as a final surface soil.
- Upper 50 mm of soil stockpiled separately in mounds 1 to 1.5 m high.
- Topsoil more than 50 mm below the surface stockpiled in mounds no higher than 1.5 to 3 m.
- The duration of stockpiling should be the minimum practicable, but ideally less than 12 months.
- No indication of topsoil contains undesirable weed seed therefore no pre-treatment (suitably buried) or removal is required.

All reasonable and practicable measures must be taken to minimise potential environmental harm potentially caused by the temporary stockpiling of erodible (dispersive) material. Stockpiles of erodible soil shall be:

- Located fully within the relevant area of works;
- Appropriately protected from wind, rain and excessive surface flows in accordance with current best practice;
- Located at least 2 m from hazardous areas, retained vegetation, and overland flow paths;
- Located at least a 100 m away from waterways, drainage lines and flood plains; and
- Located up-slope of an appropriate sediment control system.

6. Operational Stage Soil and Water Impacts

6.1 Water Quantity

A DRAINS model was developed to determine any stormwater quantity impacts. SMEC has compared the pre and post-development 1% AEP flow rates to assess the stormwater quantity impacts on the internal network (draining to the oil water separator, eventually draining to P-08 to the network external to this extent of works, refer Figure 5) and directly to the network external to this extent of works.

The catchments are shown in Figure 10. In the pre-development scenario, catchments 2B-01 and RP-01 will drain directly to the network external to this extent of works, while EX-01 drains to the oil water separator. In the post-development scenario, all three catchments will drain to the oil water separator. As such, the volume draining directly to the network external to this extent of works will decrease and SMEC has only considered the stormwater quantity impacts to the oil water separator. Aerial images of the existing bunds as seen on Google Maps are shown in Figure 11.

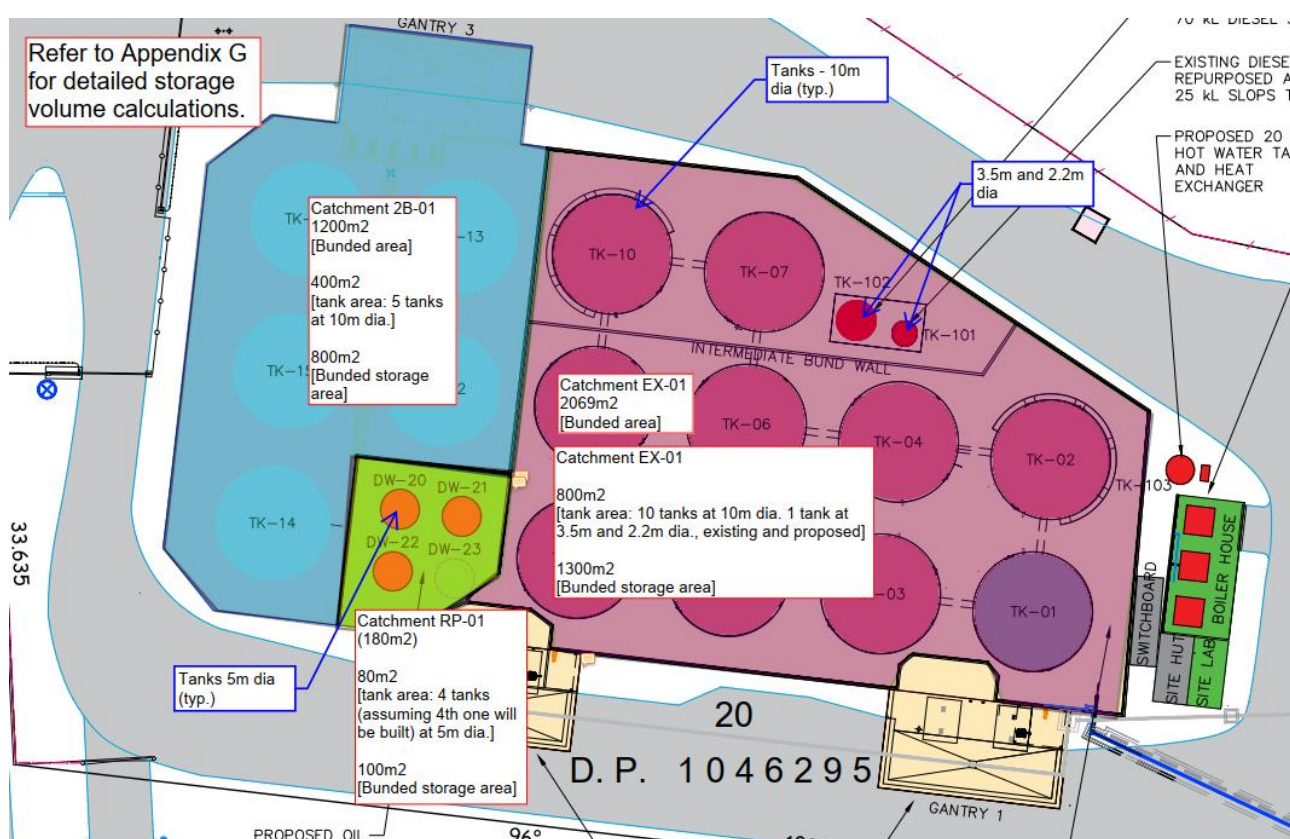


Figure 10: Catchment sizes considered



Figure 11: Aerial images of existing bunds (Source: Google Maps, accessed 11/08/25)

SMEC has considered detention based on the catchment area minus the tank area multiplied by bund height. Calculation parameters used are shown in Table 5.

Table 5: Calculation Parameters

Parameter	Unit
Pre-development catchments	EX-01 (2069m ²) [measured by GrainCorp from models / drawings] Refer to Figure 10 for catchment names.
Post-development catchments	EX-01, 2B-01 and RP-01 (total size 3449 m ²) [2B-01 and RP-01 estimated by SMEC from pdf drawings] Refer to Figure 10 for catchment names.
Tanks	Diameters: • Larger tanks (TK series except TK101 and TK102) are variable from 10m to 10.5m (at the base) [estimated from drawings and measured by Graincorp] • Smaller tanks (DW series) - 5m • TK102 - 3.5m

Parameter	Unit
	TK101 - 2.2m Volume of a single tank (TK series except TK101 and TK102): 1250m³ [as noted on drawings]
Bund height	Existing scenario: variable, average of 1.1m [noted by GrainCorp, and consistent with the spot levels of the drainage plan in Appendix A showing the bund height of 7.9m and an approximate average height of the ground level of the bund area of 6.8m] Proposed scenario: Variable, refer to Appendix G.

Graincorp has measured the existing tanks based on a 3d survey model. The bund wall varies in height and, as such, the tank heights from the base to the top of the bund wall is variable. The cross-sectional area of tanks is also variable (tank bases are sloped) and averages have also been used. Detention will equal the catchment area minus the tank cross-sectional area multiplied by the bund height. Full calculations are provided in Appendix G.

SMEC has considered the existing scenario to have all flows from a 1% AEP event being stored in the bunds and going to the oil-water separator. SMEC has modelled the bunded area as a basin in DRAINS with a weir modelled at 7.9m (top of bund level). Considering the maximum outflow of 90m³/h (0.025m³/s), the peak water level is 0.09m. Considering a more conservative outflow at half the maximum outflow (0.013m³/s), the peak water level is 0.13m. The modelled weir carries no water, meaning all water is contained within the bunded area.

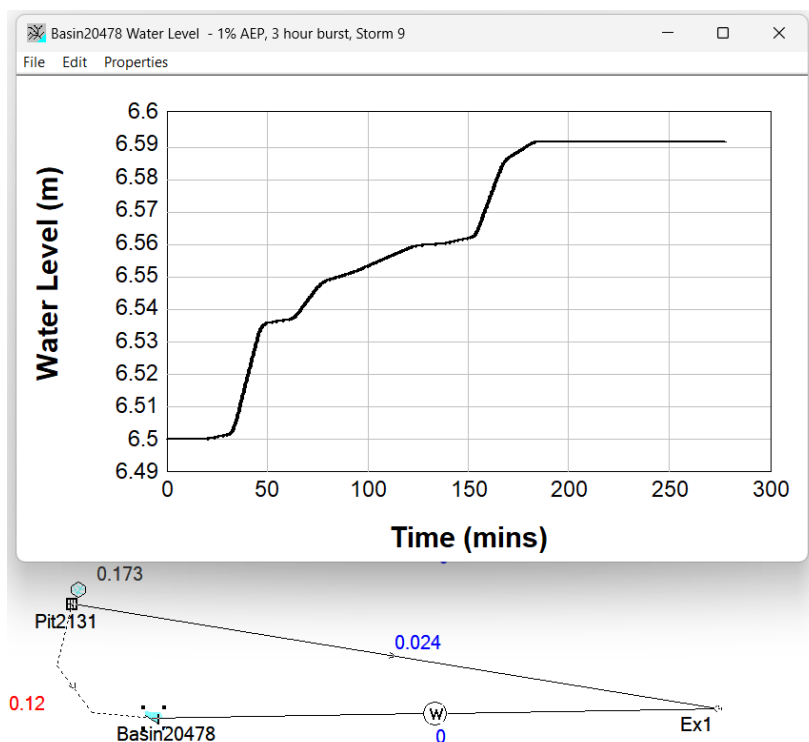


Figure 12: Existing scenario DRAINS model (maximum outflow) 1%AEP event

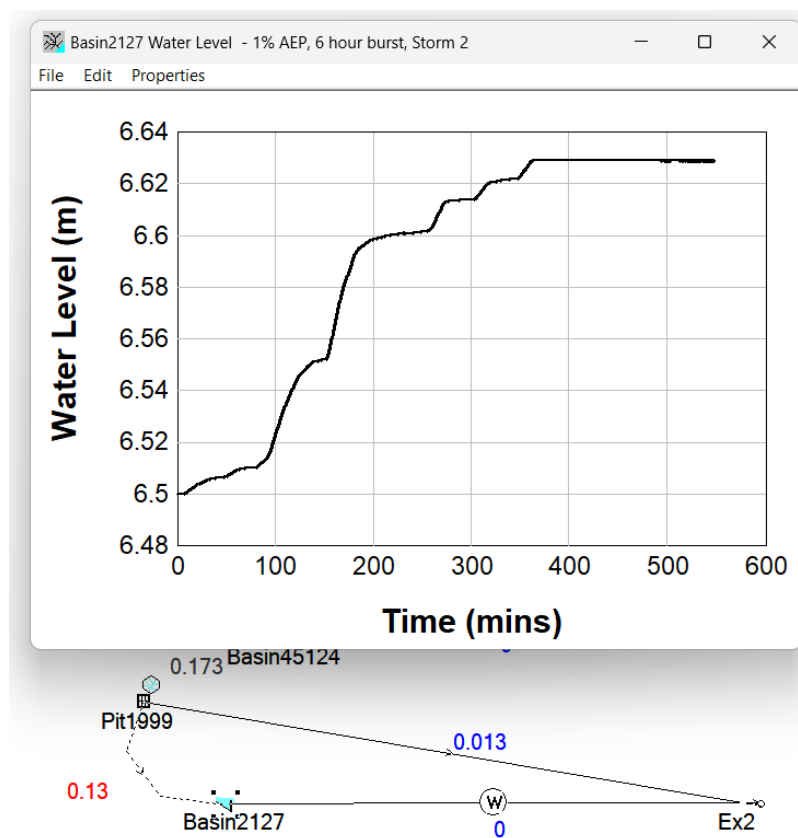


Figure 13: Existing scenario DRAINS model (half of maximum outflow) 1% AEP event

SMEC has also considered the 5% AEP event as shown below. The modelled weir carries no water, meaning all water is contained within the bunded area.

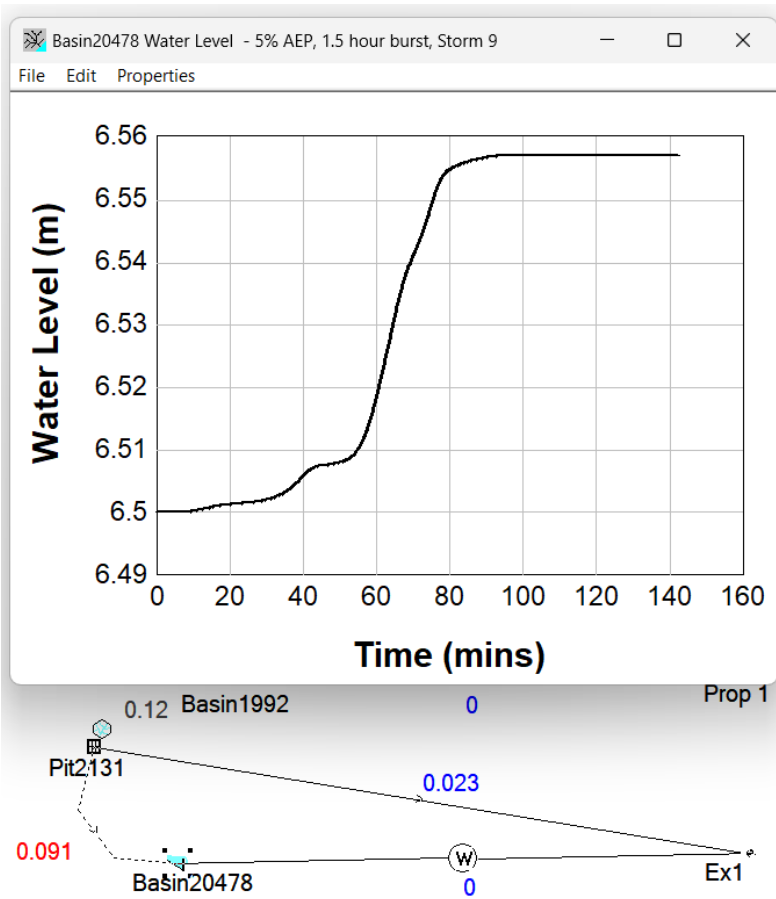


Figure 14: Existing scenario DRAINS model (maximum outflow) 5%AEP event

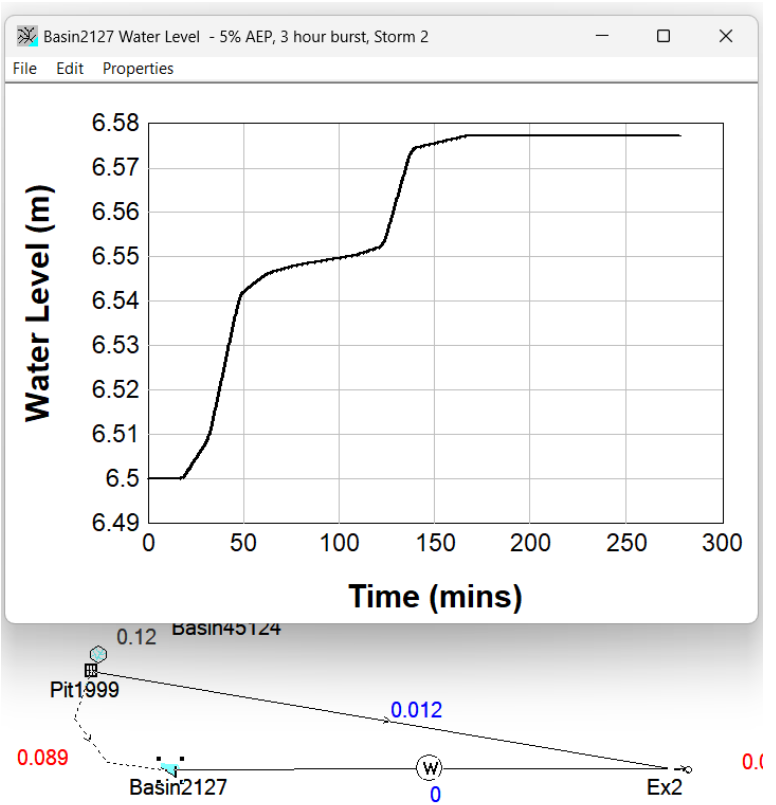


Figure 15: Existing scenario DRAINS model (half of maximum outflow) 5% AEP event

For the proposed scenario, SMEC has also considered all flows being stored in the bunds. Similarly, SMEC has assumed an outflow of 90m³/h (0.025m³/s) for the best-case scenario (based off the maximum flow through the oil water separator) and a sensitivity check assuming outflows of approximately 0.012m³/s (half of the maximum flow through the oil-water separator). For the 90m³/h scenario, the peak water level is 0.11m. For the half of 90m³/h scenario, the peak water level is 0.16m. The modelled weir carries no water, meaning all water is contained within the bunded area.

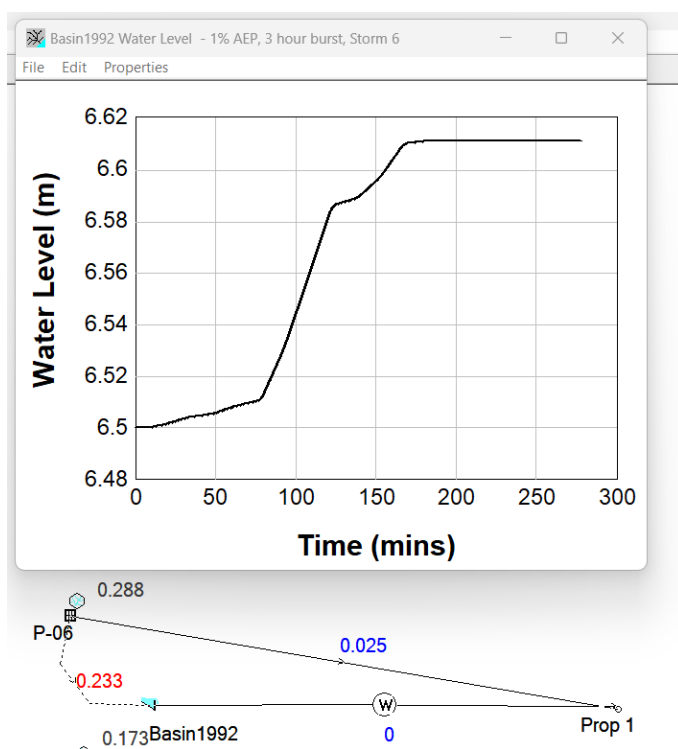


Figure 16: Proposed scenario DRAINS model (maximum outflow) 1% AEP

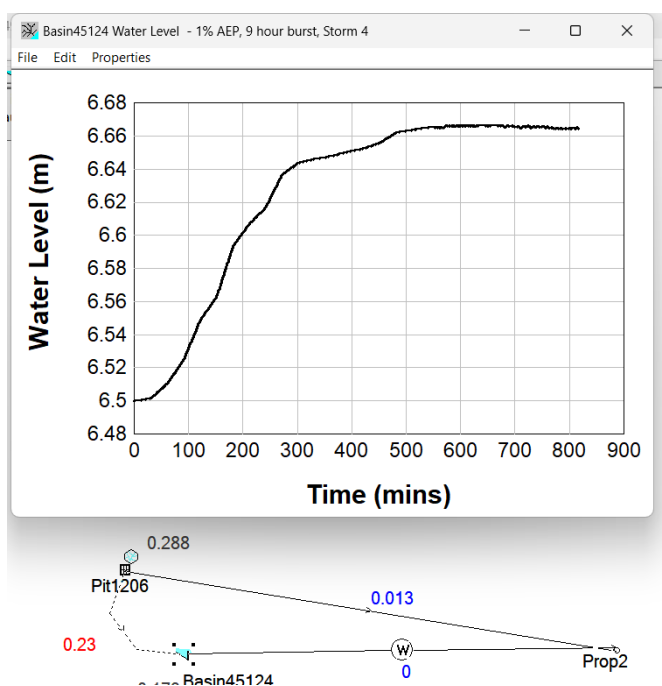


Figure 17: Proposed scenario DRAINS model (half of maximum outflow) 1% AEP

SMEC has also considered the 5% AEP event as shown below. The modelled weir carries no water, meaning all water is contained within the bunded area.

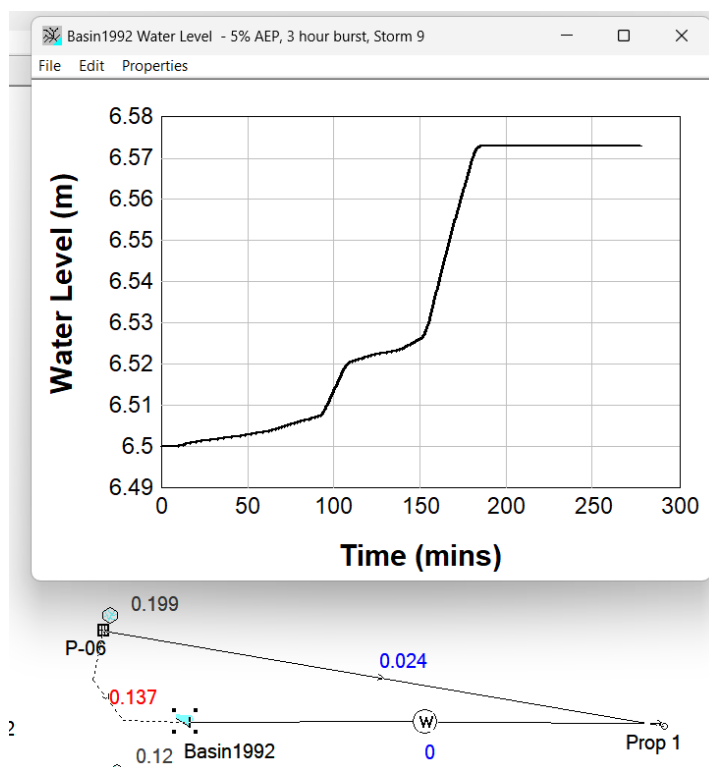


Figure 18: Proposed scenario DRAINS model (maximum outflow) 5% AEP

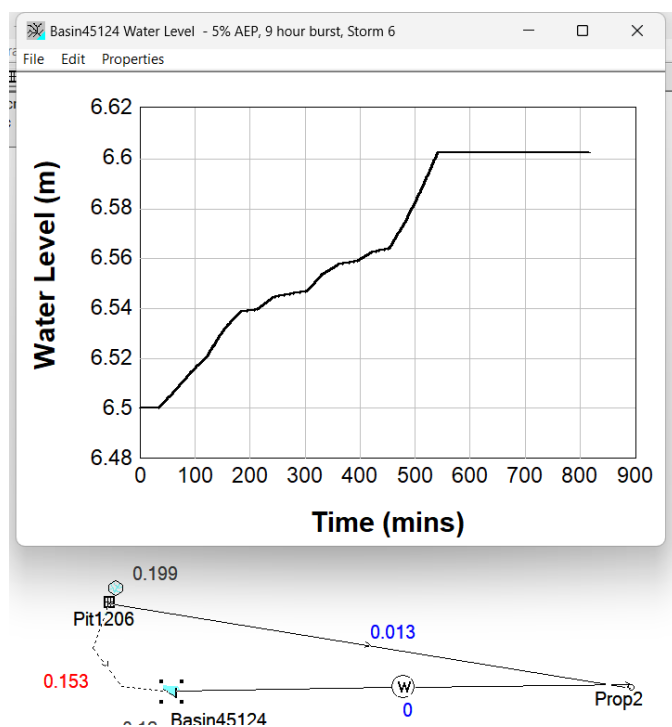


Figure 19: Proposed scenario DRAINS model (half of maximum outflow) 5% AEP

In terms of water quantity, SMEC does not foresee any negative impacts due to the development. SMEC has modelled all the flows going to the 225mm diameter pipe leading to the oil-water separator. All flows are captured in either the bunded area or pipe for both the pre and post development scenario. As such, there will be no additional overland flows as a result of this development. The flows exceed 0.025m³/s (the capacity of the oil water separator) and, as such, will be attenuated by the oil-water separated. This oil water separator has

been future proofed with consideration for this development, and it is assumed its rate of outflow (to the pit and pipe network external to the work extents) is acceptable.

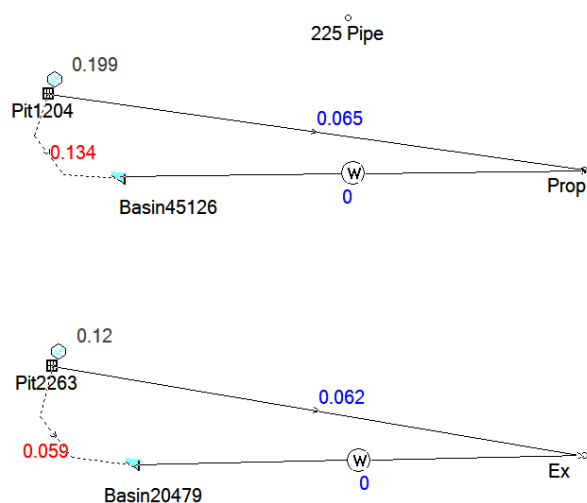


Figure 20: DRAINS model of 225mm diameter pipe leading to the oil-water separator

As such, no additional detention is required, and no negative water quantity impacts are anticipated.

6.1.1 Bund Capacity for Tank Failure

SMEC notes GrainCorp has designed for bund capacity for tank failure based on AS1940 The Storage And Handling of Flammable and The Department of Environment and Climate Change NSW's Combustible Liquids and Storing and Handling Liquids: Environmental Protection Participant's Manual.

The Department of Environment and Climate Change NSW's Combustible Liquids and Storing and Handling Liquids: Environmental Protection Participant's Manual requires:

- A minimum of 100% of the volume of the largest container stored, plus enough free board to contain rainwater and firewater if rainwater or firewater are able to enter the area.
- In sizing the volume required by rain a 1 in 20-year 24-hour storm event could be used or 95th percentile 5-day rainfall depth (mm).

The existing bunded area has been designed based on AS1940 2004. This requires:

- The net capacity of a compound shall be at least the capacity of the largest tank. The capacity of on-site containment shall be increased to include the output of any fire water over a 20 min period.

The proposed areas are being designed based on AS1940 2017. This requires:

- The net capacity of a compound shall be at least 110% of the capacity of the largest tank or 25% of the total capacity of all tanks within the bund whichever is the greater.

The requirements have been considered and met as per the calculation of bund heights provided by GrainCorp in Appendix G.

Table 6: Bunded Area Capacity

	Volume Within Bunded Area (m ³)	Volume to be contained
Existing Scenario	1420 (refer to Appendix G)	Capacity of the largest tank + max firewater with brigade booster (as per AS1940 2004) 1250+34 1284

	Volume Within Bunded Area (m ³)	Volume to be contained
Developed Scenario	1663 (refer to Appendix G)	25% of the total capacity of all tanks within the bund (as per AS1940 2017) 1663

6.2 Water Quality

6.2.1 Operational stage water quality management

SMEC has reviewed the development in terms of impacts to concentrations of gross pollutants and nutrients in stormwater runoff, which without treatment, would deteriorate the water quality of local waterbodies.

6.2.1.1 Design Criteria

The effectiveness of the treatment measures has been modelled using MUSIC version 6.4 (Model for Urban Stormwater Improvement Conceptualisation) software based off Wollongong City Council's Water Sensitive Urban Design (WSUD) Guidebook for Developers. SMEC notes that while the Guidebook mentions a MUSIC-link, SMEC has confirmed with MUSIC that Council's MUSIC-link is currently not available. However, SMEC has generally attempted to model nodes and treatments in line with the Guidebook requirements.

SMEC has used rainfall and Potential Evaporation (PET) data from Albion Park (Shellharbour Airport), rainfall station #68241 as per the Guidebook.

The Guidebook specifies that stormwater runoff from new impervious areas is to meet the following water quality targets as per Table 7.

Table 7: Minimum post development pollutant reduction targets (%)

Pollutant	Required Reduction (%)
Gross Pollutants (GP)	90
Total Suspended Solids (TSS)	85
Total Phosphorus (TP)	60
Total Nitrogen (TN)	45

6.2.1.2 Proposed Treatment Train

In the pre-development scenario, Catchments RP-01 and 2B-01 are originally grassed. SMEC notes that the grassed area may provide some treatment for total suspended solids, total nitrogen and total phosphorus. In the post-development scenario, they will become paved hardstand. Hardstand areas are modelled as 100% impervious industrial nodes in MUSIC. Surface water will temporarily pond within the bunded areas because of the bunds as discussed within Section 6.1 of this report. It is anticipated that minor treatment of flows will be provided in this ponded area through sedimentation. This is modelled as a sediment forebay in MUSIC.

SMEC does not anticipate the other works (addition of the demountable site lab, hot water tank and heat exchanger, boiler upgrades and repurposing the existing slops tank and diesel tank) to generate any additional pollutants. The building is a demountable which allows surface waters to overland flow, similar to the existing scenario.

SMEC's MUSIC model considered Group C soils (with moderate run-off potential) were assumed based on the presence of gravelly sandy clay (see Section 4.3 for additional details) and rainfall run-off parameters were adjusted according to the Guidebook.

SMEC proposes OceanGuard pit baskets for P-01, P-11, P-12 and P-06 as these pits would take in surface waters. The bunded areas (both proposed and existing) are modelled as sediment basins.

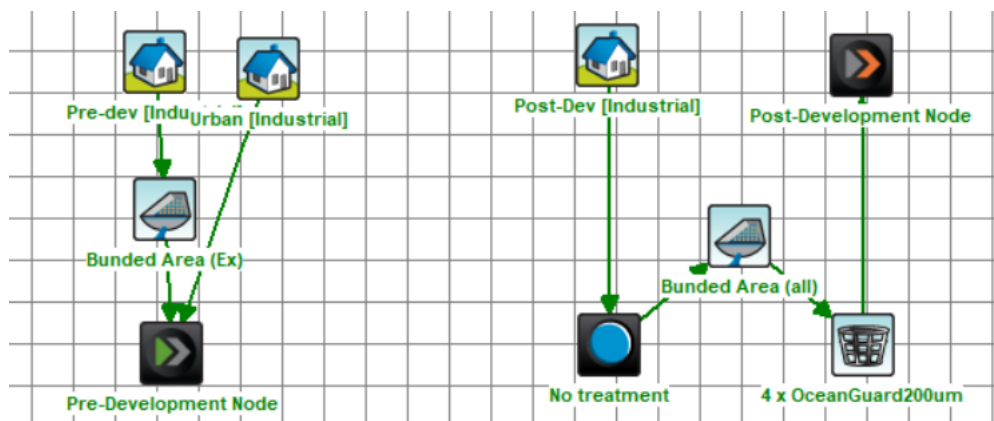


Figure 21: Proposed treatment train

For any minor sources of nitrogen, phosphorus and suspended soils that may enter the site, SMEC proposes OceanGuard pit baskets for P-01, P-11, P-12 and P-06 as these pits would take in surface waters.

The OceanGuard is a gully pit insert / basket with a filtration bag lining which can be installed within new and existing stormwater pits to capture pollution. OceanGuard performance values are shown in Table 8. The product brochures are attached in Appendix F.

Table 8: OceanGuard Performance (Source: A review of the application of OceanGuard in Australia, OceanProtect)

Parameter	Value reduction
Gross Pollutant Removal	100%
Total Nitrogen (TN) removal	21%
Total Suspended Solids (TSS) Removal	Up to 75%
Total Phosphorous (TP) Removal	30%

6.2.1.3 Water Quality Modelling Results

The results of the developed and pre-developed water quality modelling are shown in Table 9. The requirements of the Guidebook are met for pollutant reduction.

Table 9: Developed and Pre-Developed Water Quality Modelling Results

	Sources		Residual		% reduction	
	Pre	Post	Pre	Post	Pre	Post
Total Suspended Solids (kg/yr)	253.0	371.0	38.1	10.6	84.9%	97.1%
Total Phosphorus (kg/yr)	0.4	0.6	0.2	0.1	61.5%	77.7%
Total Nitrogen (kg/yr)	3.1	4.3	1.8	1.8	41.6%	58.0%
Gross Pollutants (kg/yr)	31.3	49.4	0.0	0.0	100.0%	100.0%

6.2.1.4 Maintenance Requirements

Minor maintenance procedures for the OceanGuard are typically undertaken every 3 to 4 times per year. Additional inspections are recommended after major storm events. It involves inspecting the filter bag and removing and disposing of captured pollutants. Major maintenance procedures involve replacing the filter bag and rectifying the support frame when required. Additional details are provided in Appendix F.

Based on the modelling of the bunded areas as a sediment forebay, it is assumed that the bunded areas will be cleaned out at least once per year.

7. Groundwater

7.1 Background

The GrainCorp Bulk Liquid Terminal site at Port Kembla has historically operated with mineral oil storage and handling facilities supported by an established drainage system predominantly consisting of hard, impervious surfaces and engineered stormwater infrastructure. This configuration has limited infiltration and groundwater recharge across the site, controlling surface water flow and minimizing impacts on the underlying groundwater regime.

The current proposal to repurpose the facility to accommodate Tallow and Used Cooking Oil, along with minor associated infrastructure changes, is not expected to significantly alter the existing drainage or surface water flow patterns. Given the site's predominantly concrete-covered surfaces and existing stormwater management measures, opportunities for additional water seepage or changes in groundwater recharge remain minimal. Consequently, any potential groundwater impacts and the mitigation measures previously implemented for the site's historic operations are expected to remain relevant and effective under the proposed development.

This assessment therefore focuses on confirming that the proposed works will not materially change groundwater quality or quantity, maintaining the status quo with respect to groundwater interactions at the site.

7.1.1 Purpose and Scope

The purpose of this groundwater assessment is to evaluate the potential impacts of the proposed repurposing works at the GrainCorp Bulk Liquid Terminal on the site's groundwater quality and quantity. Given the site's existing hardstand surfaces, established drainage system, and historical use for mineral oil storage and handling, this assessment specifically considers whether the proposed modifications could materially alter groundwater conditions.

The scope of this assessment is limited to confirming that the additional infrastructure and operational changes will not significantly change surface water runoff patterns, infiltration rates, or groundwater recharge.

7.2 Existing Site Conditions

7.2.1 Soil and Geology

The GrainCorp Bulk Liquid Terminal (BLT) site is situated within the reclaimed Tom Thumb Lagoon area, historically characterized by low-lying estuarine environments of swampy ground and mangrove flats. This area underwent significant reclamation works during the 1980s to support the construction of the Grain Terminal, which involved the placement of dredged sands and estuarine soils as fill material, along with slag and coal wash (Coffey, 2013a; Coffey, 2013b).

The 2013 Coffey Geotechnical Investigation confirmed that the subsurface conditions comprised:

- Fill (0–3.5 m depth) - Predominantly clayey sand and gravelly sandy clay containing minor foreign inclusions (e.g., concrete, slag).
- Alluvial and Estuarine Soils (3.5–26 m) - Silty sands, clayey silts, and silty clays of low to medium plasticity, consistent with estuarine deposition. Soils within this unit are generally loose to soft at shallow depths, grading to stiff or hard clay layers below ~15 m.
- Highly Weathered Rock (~26–28 m) - Pale grey sandstone (Budgong Sandstone), transitioning to slightly weathered to fresh sandstone below ~28 m (Coffey, 2013b).

The 2013 Coffey Waste Classification Report further characterized stockpiled materials on site (sourced from historic dredging and site stripping works) as gravelly clayey sands and sandy clays, free of significant contamination and classified as General Solid Waste (non-putrescible). Acid sulfate soil testing indicated no exceedances of the Acid Sulfate Soil Management Advisory Committee (ASSMAC) criteria, confirming low acid sulfate potential (Coffey, 2013a).

As of 2025, no significant redevelopment or additional subsurface works have occurred at the site since these investigations. The soil and geological conditions described in 2013 remain consistent with regional mapping (Geoscience Australia, 2025), which continues to classify the area as Quaternary alluvium overlying Budgong Sandstone. This stability is further supported by the absence of site works altering ground levels (below the fill mound) or subsurface conditions since the original studies.

The site remains fully sealed by hardstand concrete, further limiting direct interaction with subsurface soils or groundwater. As such, the existing soil profile continues to support low infiltration potential and limited risk of soil exposure or disturbance under the proposed repurposing works.

7.2.2 Contamination

A Contamination Certificate Assessment prepared by Environmental Resources Management (ERM) in 2013 assessed soil and groundwater quality at the GrainCorp Bulk Liquid Terminal (BLT) site. This assessment included a review of historical land use, inspection of the proposed development areas, and screening of existing soil and groundwater data against applicable guidelines at that time, including the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM, 2013).

The ERM investigation concluded:

- No significant contamination issues were identified that would preclude redevelopment for bulk liquid storage.
- Soil and groundwater analytical results were generally below adopted screening levels for commercial/industrial land use.
- Minor exceedances of arsenic, copper, and zinc were observed in groundwater, attributed to regional background influences from Port Kembla's industrial setting rather than site-derived contamination.
- Asbestos was not detected, although the report noted that its presence in underlying fill could not be entirely excluded given Port Kembla's reclamation history.
- The site was deemed suitable for its intended use, contingent upon standard management practices for any disturbance of soils or unidentified contamination during groundworks.

In 2025, these findings remain applicable. The site's operational history since 2013 has been limited to continued bulk liquids handling under sealed hardstand conditions, with no recorded incidents or redevelopment works affecting underlying soils. The NSW EPA's contaminated land database confirms that the site has not been notified under Section 60 of the Contaminated Land Management Act 1997.

Further, updated reviews of regional contamination profiles at Port Kembla (NSW EPA, 2025) indicate persistent low-level heavy metal signatures across the broader port area, consistent with ERM's original conclusions of regional rather than site-specific influence. No new contamination sources or significant changes in land use have been identified.

Given the site's fully concreted surface, existing drainage infrastructure, and the nature of the proposed repurposing works (which will not involve major excavation or soil disturbance), the risk of additional contamination exposure or migration remains low. Any ground-intrusive works during construction (e.g., for minor foundations) should continue to follow NSW EPA guidelines for unexpected finds, particularly regarding asbestos or unidentified fill contaminants.

7.2.3 Climate

The climate of Port Kembla is classified as temperate maritime, characterised by mild to warm summers and cool, wet winters influenced by coastal proximity and prevailing easterly winds. Rainfall is relatively evenly distributed throughout the year, although autumn and early winter tend to be slightly wetter periods (BOM, 2025).

7.2.3.1 Rainfall Patterns

Long-term rainfall data from the BOM's Port Kembla (BSL Central Lab) weather station (Station 068131) shows an average annual rainfall of approximately 1,200 mm, with historical fluctuations ranging between 650 mm (dry years) and 1,800 mm (wet years). Recent decadal records (2015–2024) confirm that rainfall trends remain

consistent with long-term averages, with notable peaks in 2020 (380 mm in February) linked to La Niña conditions.

7.2.3.2 Rainfall Intensity and Flood Design

Updated Intensity-Frequency-Duration (IFD) data for the site from the BOM (2025) indicates:

- 1-hour, 1% Annual Exceedance Probability (AEP) rainfall intensity: 88.1 mm/hr
- 24-hour, 1% AEP rainfall depth: 14.0 mm/hr equivalent.

These values are consistent with the ARR Data Hub (2025) Illawarra region datasets, reaffirming the regional design rainfall intensities used in flood and drainage assessments.

7.2.3.3 Storm Losses and Climate Change Factors

ARR Data Hub data (2025) indicates initial storm losses of 69 mm and continuing losses of 3.9 mm/hr, applicable to rural contexts but informing general infiltration conditions in undeveloped areas around Port Kembla.

Climate change projections for the Illawarra region predict rainfall intensity increases of up to 18% by 2050 (SSP2-4.5 scenario), primarily affecting short-duration storm events. Temperature increases of 1.4°C to 1.7°C by 2050 are also forecast, consistent with the IPCC AR6 projections integrated into ARR Version 4.2.

7.2.3.4 Implications for the Site

Given the site's existing concrete hardstand and drainage infrastructure (Section 4.1), the potential for rainfall-driven infiltration into groundwater is negligible. The proposed repurposing works will not alter runoff pathways or drainage capacity, meaning groundwater interactions will remain unchanged under current and future climatic conditions.

7.2.4 Hydrogeology and Groundwater Regime

The GrainCorp Bulk Liquid Terminal (BLT) site is situated within the Illawarra Coastal Plain, an area underlain by Quaternary alluvial deposits and estuarine sediments over the Budgong Sandstone bedrock formation (Coffey, 2013b). The hydrogeological regime of the site is shaped by these unconsolidated estuarine and reclaimed fill deposits, which are characterised by low to moderate permeability and variable groundwater responses to rainfall and tidal influences.

7.2.4.1 Groundwater Occurrence and Depth

Historical site investigations undertaken by Coffey (2013b) recorded groundwater at depths of approximately 1.0–2.5 m below ground level (mbgl) across borehole locations. Groundwater was observed within the estuarine silty sand and sandy clay units, consistent with shallow unconfined aquifer conditions typical of coastal reclamation areas. Given the site's proximity to Gurungaty Waterway and the Tasman Sea, groundwater levels are considered to be influenced by local tidal fluctuations, regional hydraulic gradients, and the surface drainage network.

7.2.4.2 Groundwater Quality

Groundwater analytical results from the ERM (2013) Contamination Certificate indicated generally low contaminant concentrations, with minor exceedances of arsenic, copper, and zinc consistent with regional background conditions associated with Port Kembla's industrial setting. Hydrocarbon fractions (TPH, BTEX) were not detected above relevant guideline levels, and no dissolved phase contamination plumes were identified. Salinity levels were elevated, reflecting the coastal setting and marine influence.

These findings remain valid in 2025, with no subsequent excavation or redevelopment works undertaken since the original investigations that would affect groundwater conditions. The NSW Water Quality Objectives (NSW EPA, 2025) for the Illawarra Coast confirm that groundwater in this area is naturally brackish and not suitable for potable use.

7.2.4.3 Hydrogeological Characteristics

- Aquifer Type - Shallow unconfined aquifer within estuarine and fill materials.
- Permeability - Low to moderate (dominated by silty sands and sandy clays).
- Recharge Mechanisms - Primarily limited rainfall infiltration in undeveloped adjacent areas; negligible infiltration within the concreted BLT site.
- Discharge Mechanisms - Lateral groundwater flow towards Gurungaty Waterway and minor seepage to the stormwater network.
- Groundwater-Surface Water Interaction - Hydraulic continuity is anticipated between shallow groundwater and adjacent waterways, though buffered by low-permeability estuarine clays restricting rapid exchange.

7.2.4.4 Implications for the Proposed Works

The hydrogeological regime beneath the BLT site is stable and highly constrained by its sealed surface and engineered drainage network. As the proposed repurposing works will not alter the impermeable site cover, drainage design, or require significant subsurface excavation, there will be no material change to groundwater recharge, flow patterns, or quality. Historical groundwater mitigation measures (e.g., containment of spills through bunding and oily water separation) remain applicable and effective under the proposed site adjustments.

7.2.5 Historical Groundwater Monitoring

Groundwater monitoring at the GrainCorp Bulk Liquid Terminal (BLT) site has been historically undertaken as part of the 2013 Environmental Resources Management (ERM) Contamination Certificate and the Coffey Geotechnical Investigation. These assessments established baseline groundwater quality and depth conditions prior to any redevelopment of the site.

7.2.5.1 Monitoring Program and Parameters

The ERM (2013) assessment included the collection and analysis of groundwater samples from monitoring wells installed across the BLT site. Parameters analysed included:

- Metals - Arsenic, copper, zinc, lead.
- Hydrocarbons - Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX).
- General Indicators - pH, electrical conductivity (salinity), and dissolved oxygen.

The Coffey (2013) geotechnical investigation also recorded groundwater depths (generally between 1.0–2.5 m below ground level) across boreholes, confirming shallow unconfined aquifer conditions typical of coastal reclamation sites.

7.2.5.2 Key Findings

- Low Contaminant Levels - Groundwater quality was generally compliant with the adopted commercial/industrial criteria under the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM, 2013).
- Regional Metal Influence - Minor exceedances of arsenic, copper, and zinc were attributed to regional background contamination from historic Port Kembla industrial activity rather than site-specific impacts.
- No Hydrocarbon Impact - Hydrocarbons (TPH, BTEX) were below detection limits, indicating no evidence of petroleum-derived contamination.
- Saline Conditions - Elevated salinity and conductivity were consistent with marine influence, reflecting the coastal location and shallow water table.
- Stable Groundwater Regime - Monitoring data suggested that groundwater levels and chemistry were stable across the site.

7.2.5.3 Regulatory Context and Current Relevance (2025)

Since 2013, there has been no significant redevelopment or ground disturbance at the BLT site. As a result, groundwater conditions identified during the historical monitoring remain representative of current site conditions. The NSW EPA contaminated land register confirms that the site has not been subject to remediation orders or formal regulation under the *Contaminated Land Management Act 1997*, and no further groundwater monitoring has been mandated since the original studies.

7.2.5.4 Implications for the Proposed Works

Given the sealed hardstand, engineered drainage network, and absence of recent excavation, the potential for groundwater impact remains negligible. The historical monitoring demonstrates that groundwater beneath the site has limited environmental sensitivity, with interactions controlled by low-permeability soils and minimal recharge. The proposed repurposing works will not change surface drainage or introduce new pathways for infiltration, and therefore no additional groundwater monitoring is warranted beyond standard unexpected finds protocols during construction.

7.3 Impact Assessment

This section assesses the potential impacts of the proposed GrainCorp Bulk Liquid Terminal (BLT) repurposing works on local groundwater conditions, considering both the construction and operational phases. The assessment draws on historical site investigations, current site conditions, and the nature of the proposed works to evaluate the likelihood of any material changes to groundwater quality, quantity, or recharge characteristics.

7.3.1.1 Construction Phase

The construction phase of the proposed works is limited in scope, comprising minor earthworks and pad construction to support pre-treatment tanks and the construction of a new hot water tank, and a site laboratory. Given the relatively shallow excavation depth expected (typically not exceeding 1 m below ground level), the risk of intercepting the water table—historically observed at 1.0–2.5 m below ground level (Coffey, 2013)—is low.

Nonetheless, there remains a short-term potential for localised groundwater interactions, such as:

- Minor dewatering requirements in isolated areas should shallow groundwater be encountered during footing installation.
- Temporary exposure of soils may slightly increase the risk of mobilising surface contaminants during rain events.

However, these risks are manageable through standard construction-phase controls including:

- Implementation of erosion and sediment controls (see Section 5).
- Use of bunding, spill response kits, and controlled excavation practices to prevent runoff or contaminants from reaching infiltration pathways.
- Adoption of a Construction Environmental Management Plan (CEMP) with protocols for unexpected groundwater finds.

Given these mitigation strategies and the sealed nature of the existing site, any construction-related groundwater impacts are anticipated to be short-term, low-risk, and reversible.

7.3.1.2 Operational Phase

Once operational, the repurposed BLT will continue to function under fully sealed concrete hardstand conditions with an established contained drainage system that directs runoff into the oily water separator and site stormwater infrastructure. The additional infrastructure, such as hot water tanks and reticulation systems, will be constructed on new concrete slabs and within bunded areas, eliminating any potential for infiltration or changes to groundwater recharge.

No new below-ground tanks, pits, or unsealed surfaces are proposed, and no alteration to the site's impervious footprint or drainage pathways is anticipated. As such:

- The potential for new pathways of groundwater contamination is negligible.
- The existing stormwater management system remains sufficient for containing and directing potential spills or runoff.
- Operational risks remain identical in nature and magnitude to the historical use of the site for mineral oil handling.

7.3.1.3 Cumulative Risk and Comparison with Previous Use

The proposed handling of tallow and used cooking oil (UCO) does not represent an increased hazard to groundwater compared to the site's historical use for mineral oil storage. These new products are similarly hydrophobic and are managed using comparable containment and spill prevention infrastructure. Existing bunding, oily water separation, and truck-out protocols for waste and slops remain in place.

Cumulatively, the proposed works do not alter the site's risk profile with respect to groundwater. Groundwater remains protected by:

- The existing concrete hardstand, which eliminates infiltration.
- Bunded storage areas and secondary containment for all critical infrastructure.
- A sealed and directed drainage system, isolating surface operations from the subsurface environment.

Given the unchanged drainage regime and lack of infiltration pathways, the site will continue to operate with a negligible groundwater risk, consistent with historical site conditions and regulatory expectations.

7.4 Mitigation and Management Measures

To ensure that groundwater quality remains protected throughout both the construction and operational phases of the GrainCorp Bulk Liquid Terminal (BLT) repurposing, a suite of mitigation and management measures will be implemented. These measures build upon the existing site controls and are consistent with best-practice approaches used historically during the site's operation for mineral oil storage.

7.4.1.1 Construction Phase Measures

During the short-term construction phase, the following measures will be adopted to prevent groundwater impacts:

- Erosion and Sediment Controls - Installation of temporary controls (e.g., silt fences, geotextile barriers) in accordance with *Managing Urban Stormwater: Soils and Construction (Blue Book, Landcom 2004)* to prevent sediment-laden runoff from entering drains or potential infiltration points.
- Unexpected Finds Protocol - If evidence of contaminated soil or groundwater is encountered during excavation (e.g., odours, staining, sheen on water), works will cease immediately, and a qualified environmental consultant will assess and manage the contamination in accordance with NSW EPA guidelines.
- Dewatering Protocols (if required) - Should shallow groundwater be encountered, any extracted water will be tested and, if necessary, treated or tankered offsite to a licensed facility prior to discharge, in compliance with EPA and Sydney Water requirements.

This is further discussed in Section 5.

7.4.1.2 Operational Phase Measures

Once operational, the following measures will be implemented to ensure ongoing groundwater protection:

- Bunding of New Tanks and Equipment - All new tanks (including pre-treatment tanks and hot water systems) will be installed on impervious concrete pads within bunded areas, designed in accordance with AS 1940:2017 (The Storage and Handling of Flammable and Combustible Liquids) to contain 110% of the largest vessel or 25% of the combined volume of all vessels within the bund.

- Continued Operation of the Oil-Water Separator (OWS) - The existing OWS will remain operational and will be routinely inspected and maintained to ensure effective treatment of stormwater prior to discharge, preventing hydrocarbon or product entrainment into the drainage network.
- Spill Response Protocols - The site's spill response procedures will be maintained and updated to reflect the new stored products. This includes:
 - Provision of spill kits (e.g., absorbent pads and booms) in key operational areas.
 - Immediate cleanup of spills using appropriate methods to prevent entry into the drainage system.
 - Regular staff training and drills to ensure preparedness and correct response actions.
- Routine Inspections and Maintenance - Scheduled inspections of bunds, drainage lines, and the OWS will be conducted to confirm integrity and compliance, with maintenance records retained.

7.4.1.3 Groundwater Contingency Measures

- Monitoring of Drainage Infrastructure - Routine checks of drains and pits (including P-08 discharge point) to ensure no signs of product leaks or sheen are present.
- Contingency for Product Leaks - Any leaks detected from tanks or pipelines will be immediately isolated, repaired, and managed under established spill containment and recovery procedures.
- Unexpected Groundwater Contamination Response - While unlikely given the fully sealed site, should contamination be identified (e.g., via visual evidence or routine inspection), investigations will be initiated under the NSW EPA's *Guidelines for the Management of Contaminated Land*.

These mitigation and management measures collectively ensure that no new groundwater contamination pathways will be introduced. They are consistent with controls historically applied during the site's prior mineral oil operations, which have successfully maintained groundwater quality under a comparable risk profile.

7.5 Monitoring and Review

Given the site's existing hardstand conditions, contained drainage system, and long history of similar land use without recorded groundwater contamination, the risk of groundwater impact from the proposed repurposing works is low. Therefore, a proportionate and risk-based monitoring approach is recommended.

7.5.1.1 Routine Monitoring

Routine groundwater monitoring is not required under current site conditions due to the following:

- The entire operational footprint is sealed with impervious concrete hardstand, effectively preventing infiltration.
- All proposed new infrastructure (e.g., tanks, heat exchangers) will be placed on bunded slabs or within contained areas.
- No new below-ground works or drainage changes are proposed that could alter recharge or contamination pathways.
- The existing oily water separator and stormwater system will continue to manage surface water in a controlled manner.

These measures ensure that the potential for groundwater recharge and pollutant migration is negligible, and that risks remain consistent with historical operations involving mineral oil storage.

7.5.1.2 Trigger-Based Monitoring

While ongoing groundwater monitoring is not deemed necessary, a trigger-based monitoring approach is recommended under the following circumstances:

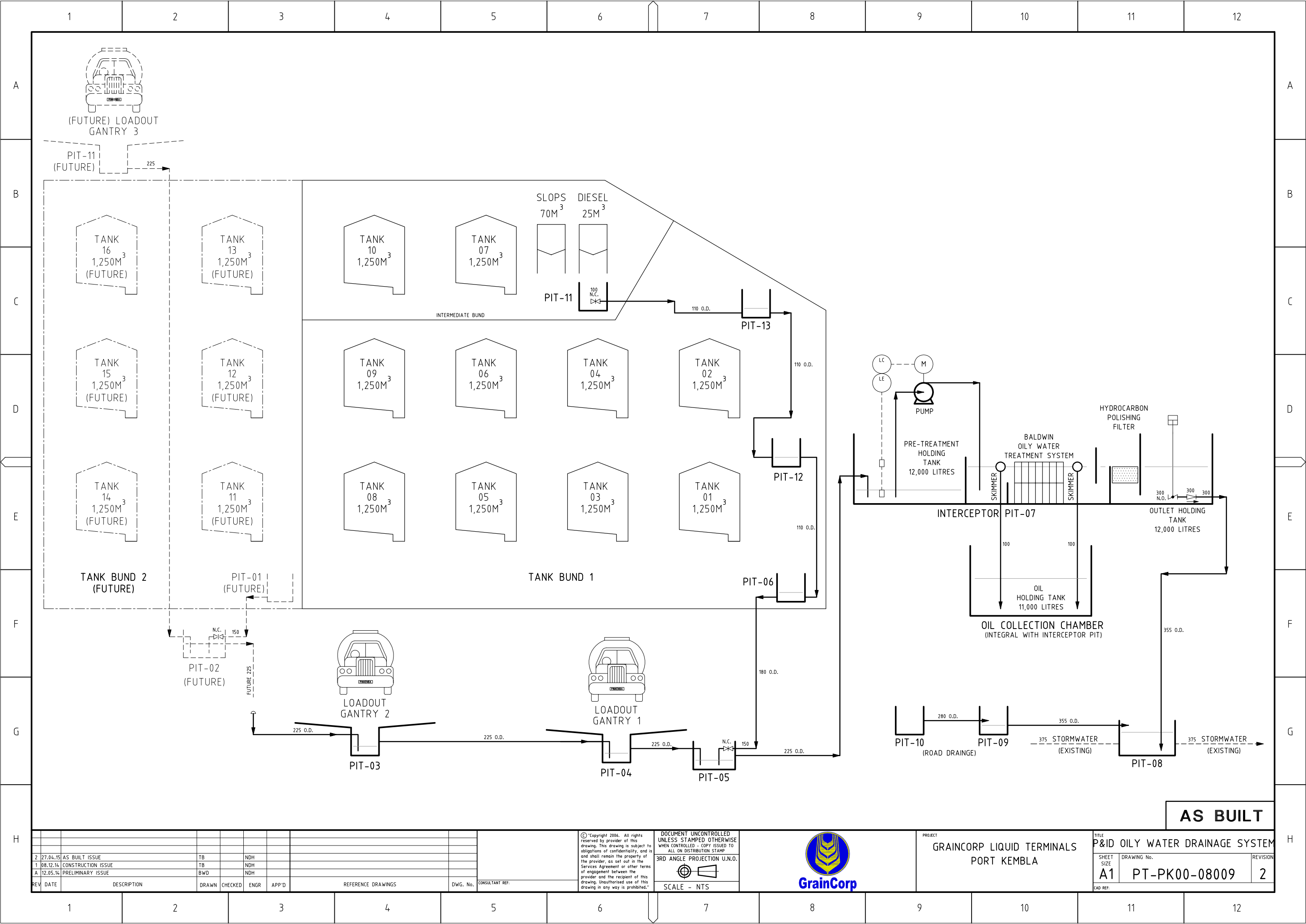
- Significant soil disturbance occurs during excavation, demolition, or unexpected subsurface works that exceed 1.5 m below surface level.

- Visual or olfactory indicators of contamination are observed during works (e.g., staining, odour, product sheen).
- Changes in site use or chemical handling practices introduce new potential contaminants or increase spill risk.
- A major uncontrolled spill or failure of containment systems occurs.

In such cases, groundwater monitoring will be initiated under the guidance of a suitably qualified environmental consultant and in accordance with the *NSW EPA Guidelines for the Assessment and Management of Contaminated Land*.

Appendix A

Drawings of Existing Works and Details of Oil Water Separator



REV	DATE	DESCRIPTION	DRAWN	CHECKED	ENGR	APP'D	REFERENCE DRAWINGS	DWG. No.	CONSULTANT REF.
2	27.04.15	AS BUILT ISSUE	TB		NDH				
1	08.12.14	CONSTRUCTION ISSUE	TB		NDH				
A	12.05.14	PRELIMINARY ISSUE	BWD		NDH				

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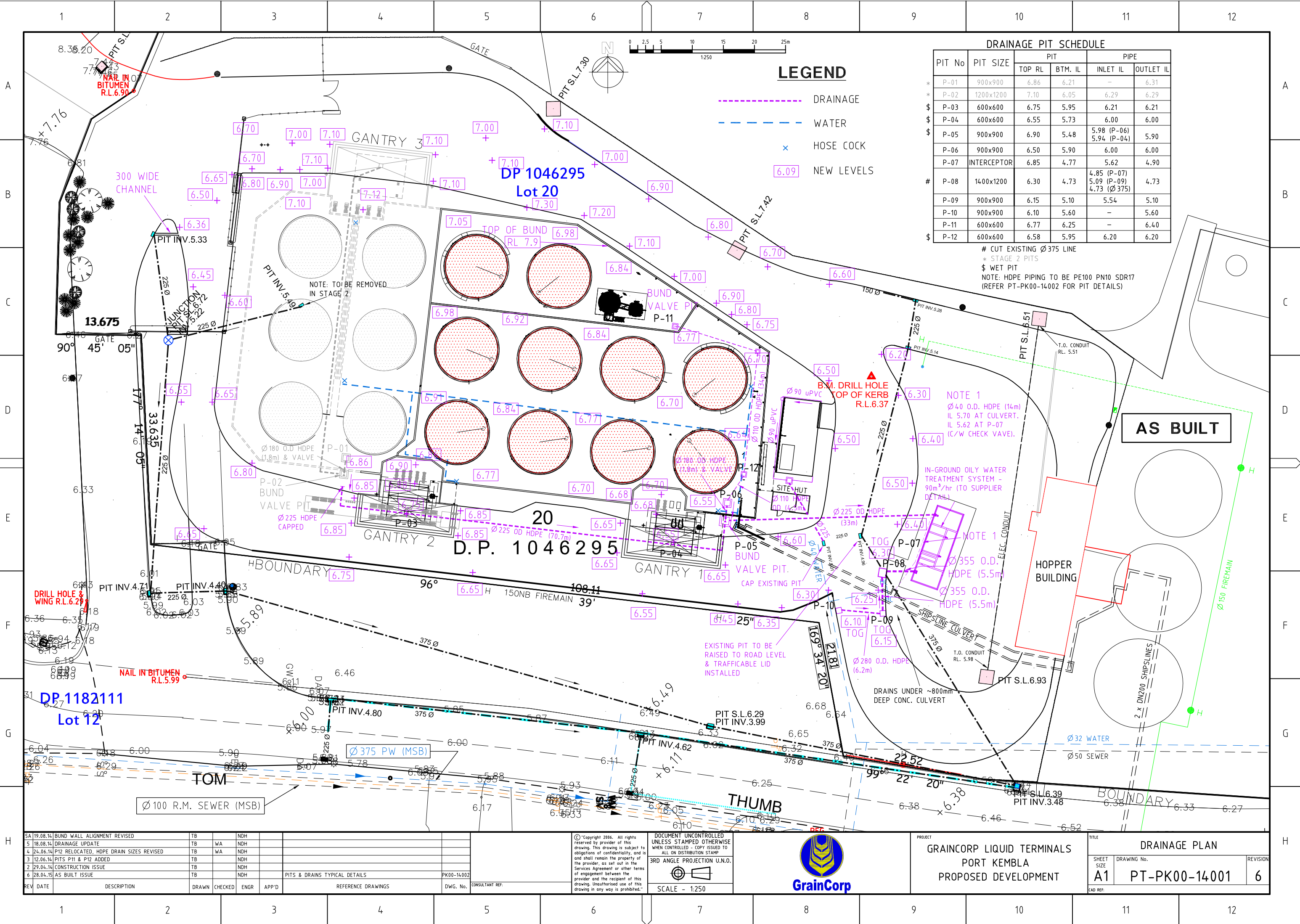
3RD ANGLE PROJECTION U.N.O.

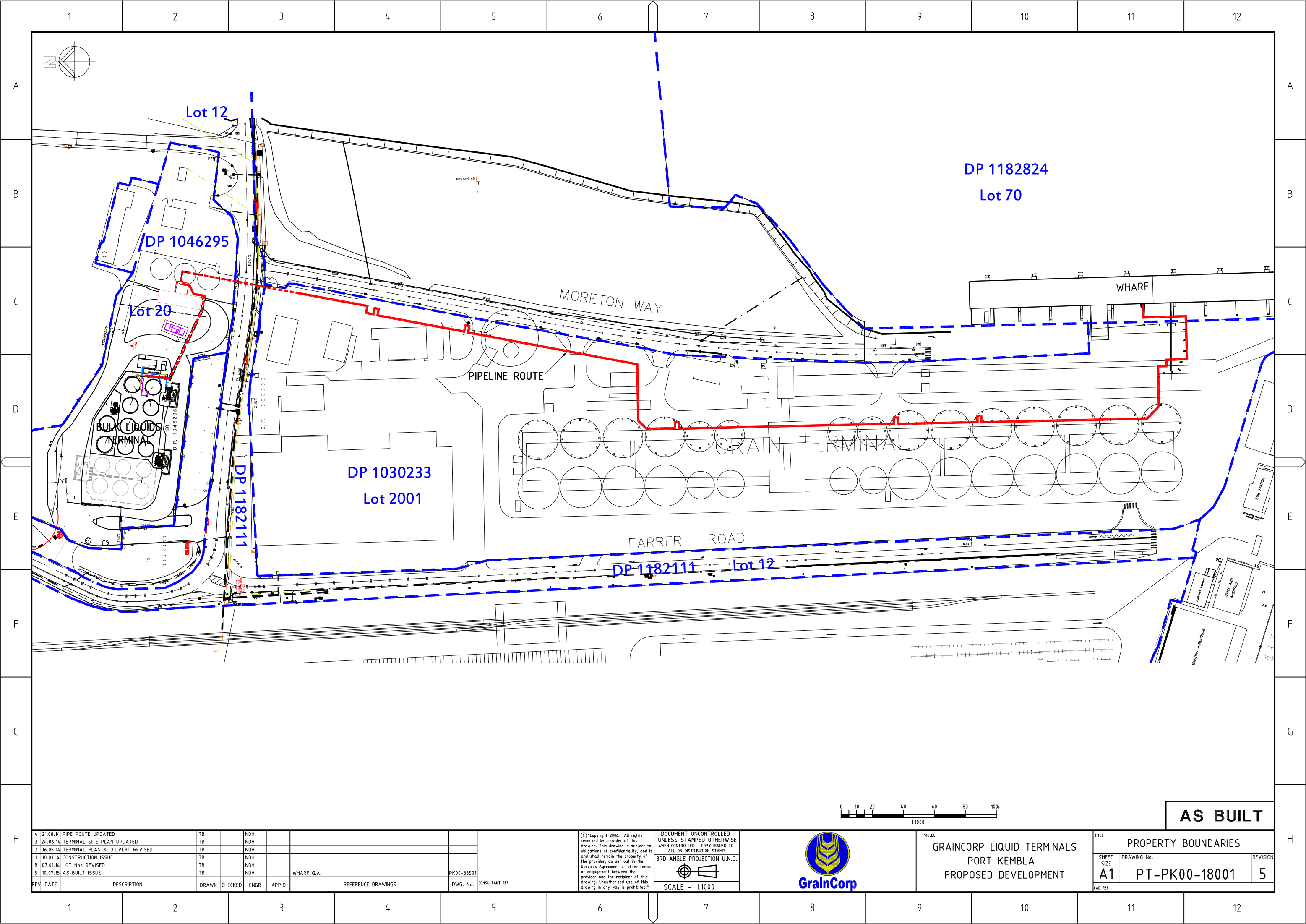
SCALE - NTS



PROJECT
GRAINCORP LIQUID TERMINALS
PORT KEMBLA

TITLE P&ID OILY WATER DRAINAGE SYSTEM		
SHEET SIZE	DRAWING No.	REVISION
A1	PT-PK00-08009	2
CAD REF:		





REV	DATE	DESCRIPTION	DRAWN	CHECKED	ENGR	APP'D	REFERENCE DRAWINGS	DWG. No.	CONSULTANT REF.
4	21.08.14	PIPE ROUTE UPDATED	TB		NDH				
3	24.06.14	TERMINAL SITE PLAN UPDATED	TB		NDH				
2	06.05.14	TERMINAL PLAN & CULVERT REVISED	TB		NDH				
1	10.01.14	CONSTRUCTION ISSUE	TB		NDH				
B	07.01.14	LOT Nos REVISED	TB		NDH				
5	10.07.15	AS BUILT ISSUE	TB		NDH		WHARF G.A.	PK00-38501	

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3RD ANGLE PROJECTION U.N.O.
SCALE - 1:1000

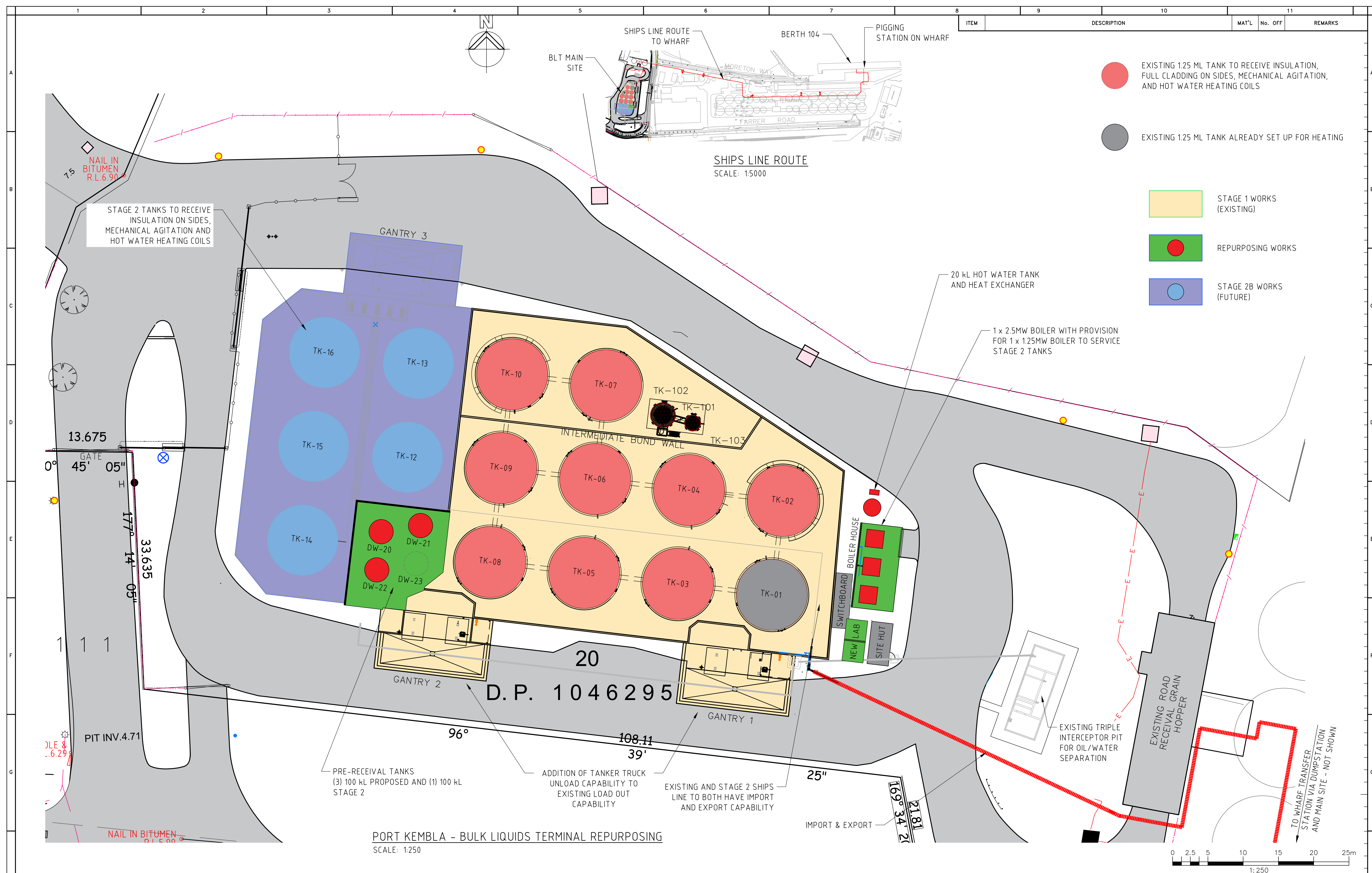


PROJECT
GRAINCORP LIQUID TERMINALS
PORT KEMBLA
PROPOSED DEVELOPMENT

TITLE PROPERTY BOUNDARIES		
SHEET SIZE A1	DRAWING No. PT-PK00-18001	REVISION 5
CAD REF:		

Appendix B

Proposed Works Staging

[illegible]

Appendix C

Flood Certificate for Project Site

C Duong
Level 7, 40 Mount Street
NORTH SYDNEY NSW 2060

CERTIFICATE	CERT-2025/4737
Issued	08 August 2025
Council Property Reference	390015

Dear Sir/Madam

FLOOD LEVEL INFORMATION ADVICE

Reference is made to your request for flood level information concerning the property below:

Description	Grain Terminal North - Lease Number AH774383 Lease Number AH774384
Location	Grain Terminal Tom Thumb Road PORT KEMBLA NSW 2505

Historical Flood Levels

The enclosed **Map 1** shows previously recorded flood levels with approximate location, if any, in the vicinity of the subject property. Should the level/s not be located in the vicinity of the subject property, they may not be relevant to the subject property.

If there are no levels shown on the map, then Council has no historical recorded flood levels available. As Council's records are not complete, this does not mean that flooding has not occurred in the past or will not occur in the future.

These historic flood levels are approximate only and should not be relied upon for any development purpose.

Flood Level Information

Please refer to the **Map 2**, **Map 3** and **Map 4** for anticipated flood levels in the vicinity of the subject property, where available. Flood levels are extracted from the Wollongong City Flood Study dated August 2019 and provided for a range of AEP events up to the PMF.

Flood level increases due to climate change and sea level rise may be applicable for any development on the subject property. For further information refer to the adopted Wollongong City Floodplain Risk Management Study and Plan dated November 2015 on Council's website: <https://wollongong.nsw.gov.au/about/floods-and-stormwater/catchments>

It is recommended to obtain surveyed ground levels of the property and buildings in metre AHD. This information along with the flood levels can be used to determine the effect/depth of flooding, if any, on this property.

Flood Velocities

Please refer to the **Map 5** and **Map 6** for anticipated flood velocities in the vicinity of the subject property, where available. Flood velocities are extracted from the Wollongong City Flood Study dated August 2019. These velocities are indicative only and may vary considerably. They do not consider local conditions or changed conditions due to new development since the study commenced.

Flood Risk Precincts (FRP)

Council is currently undertaking a review of the existing Floodplain Risk Management Study and Plan for this catchment. Extracted FRP classification from the Wollongong City Floodplain Risk Management Study and Plan dated November 2015 is enclosed in **Map 7**, if applicable for the subject property. The FRP for this property is currently under review, however the outcomes from this review are not yet available. You may wish to engage a suitably qualified Civil Engineer, experienced in hydraulics and floodplain management, to determine the applicable FRP classification for the subject property. This risk precinct would be used for development application purposes only.

On completion of a revised Floodplain Risk Management Study and Plan the flood notation on this property will be reassessed.

Other Relevant Information

Flood studies and Floodplain Risk Management Studies and Plans may not study all watercourse tributaries/overland flow paths on the subject property. A flood investigation/study of the full extent of tributaries maybe required. The services of a suitably qualified Civil Engineer experienced in hydraulics and floodplain management can be engaged to get advice.

NSW Flood Data Portal

Council's flood data including reports, model results and inputs files are available on NSW Flood Data Portal. Registered users can download model results and input files from the portal in the following website: <https://flooddata.ses.nsw.gov.au/>

Flood Policies

For information on Council's requirements for development on flood affected lands, please refer to the DCP, the LEP, the NSW Government's Floodplain Development Manual and the relevant Flood Studies and Floodplain Risk Management Studies and Plans. The DCP and Council adopted Flood Studies and Floodplain Risk Management Studies and Plans are available on Council's website. Alternatively, the services of a suitably qualified Civil Engineer experienced in hydraulics and floodplain management can be engaged to get advice regarding development opportunities.

Disclaimer

Council is providing this information in good faith and does not warrant the accuracy of the information provided in response to this request. A suitably qualified Civil Engineer experienced in hydraulics and floodplain management should be engaged to assist in the interpretation of the information provided by the Council.

For any questions regarding flood information, please contact Wollongong City Council on the telephone number below.

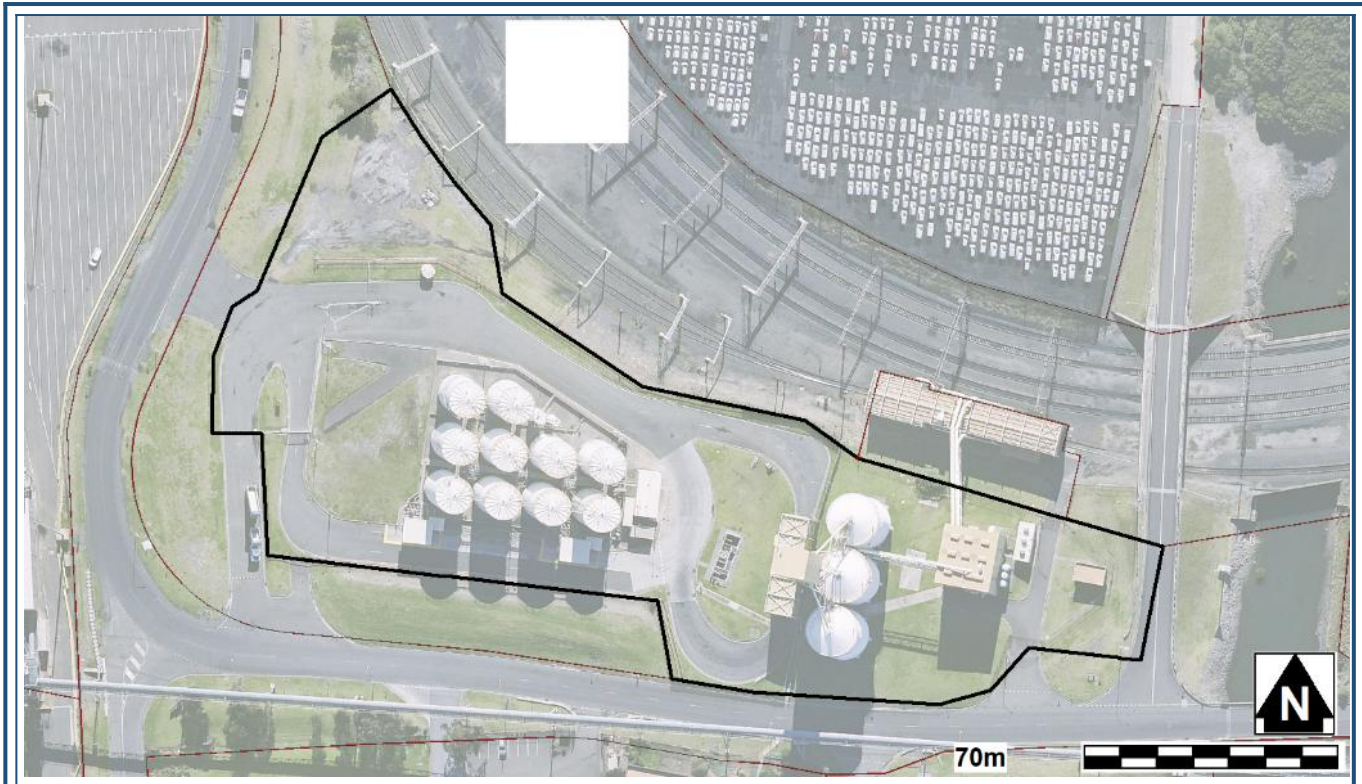
This letter is authorised by
Floodplain Management Team
Wollongong City Council
Telephone (02) 4227 7111

Glossary

Abbreviation	Description
AEP	<i>Annual Exceedance Probability</i> indicates same meaning as described in NSW Floodplain Development Manual.
AHD	<i>Australian Height Datum</i> as described in Council's DCP. In this document levels are referenced to metre AHD.
DCP	<i>Development Control Plan</i> refers to "Wollongong Development Control Plan (DCP) 2009" adopted by Wollongong City Council.
FRP	<i>Flood Risk Precincts</i> as described in Council's DCP.
LEP	<i>Local Environmental Plan</i> refers to "Wollongong LEP 2009".
NSW	The state of <i>New South Wales</i>
PMF	<i>Probable Maximum Flood</i> indicates same meaning as described in NSW Floodplain Development Manual.

Note for Maps

1. All maps in this advice are auto generated using the best available information on the printing date.
2. All levels are in m AHD and velocities are in m/s.
3. The abbreviation 'N/A' on the map indicates 'not applicable'.



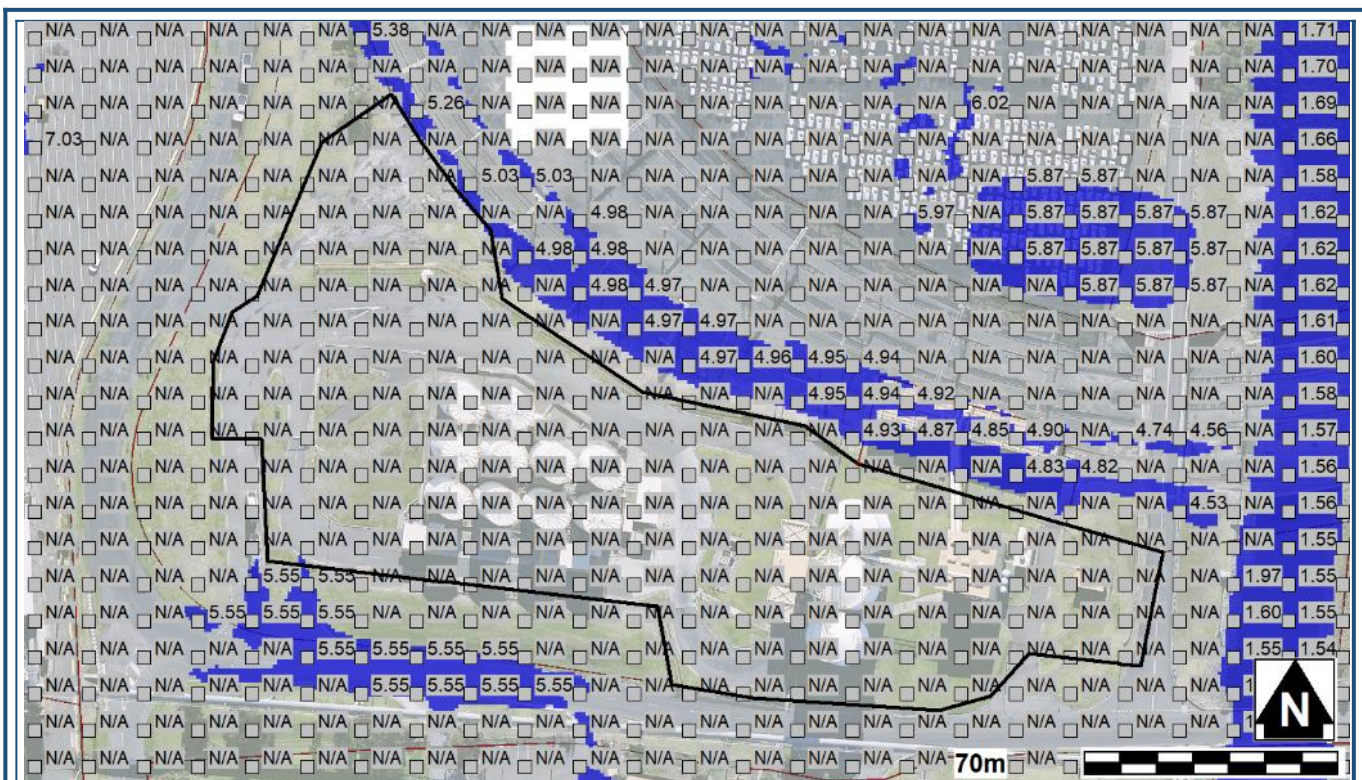
Wollongong City Council Historical
Flood Level Database

Map 1: Historical
Flood Level

Property: Grain Terminal Tom
Thumb Road PORT KEMBLA NSW
2505

Printed:
08/08/2025

This automated map was produced using the best available information on the printing date. While every effort has been made to ensure the highest possible quality of data, no liability will be accepted for any inaccuracy of the information shown. Copyright © Wollongong City Council. This map may not be reproduced in any form whatever without the express written permission of Wollongong City Council.



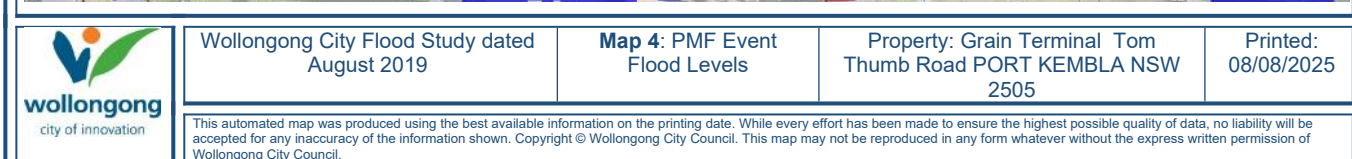
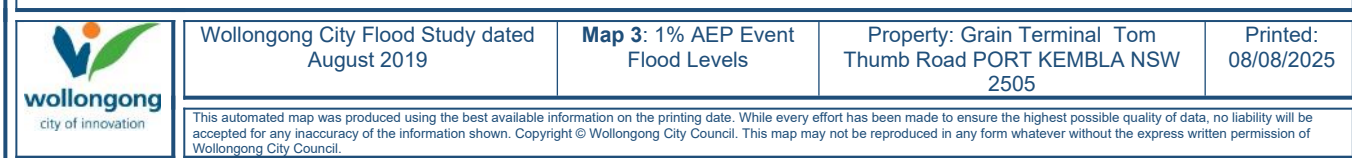
Wollongong City Flood Study dated
August 2019

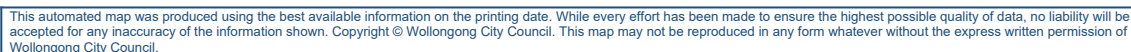
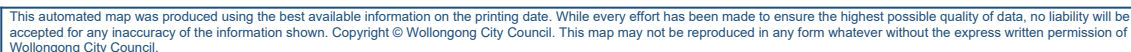
Map 2: 20% AEP Event
Flood Levels

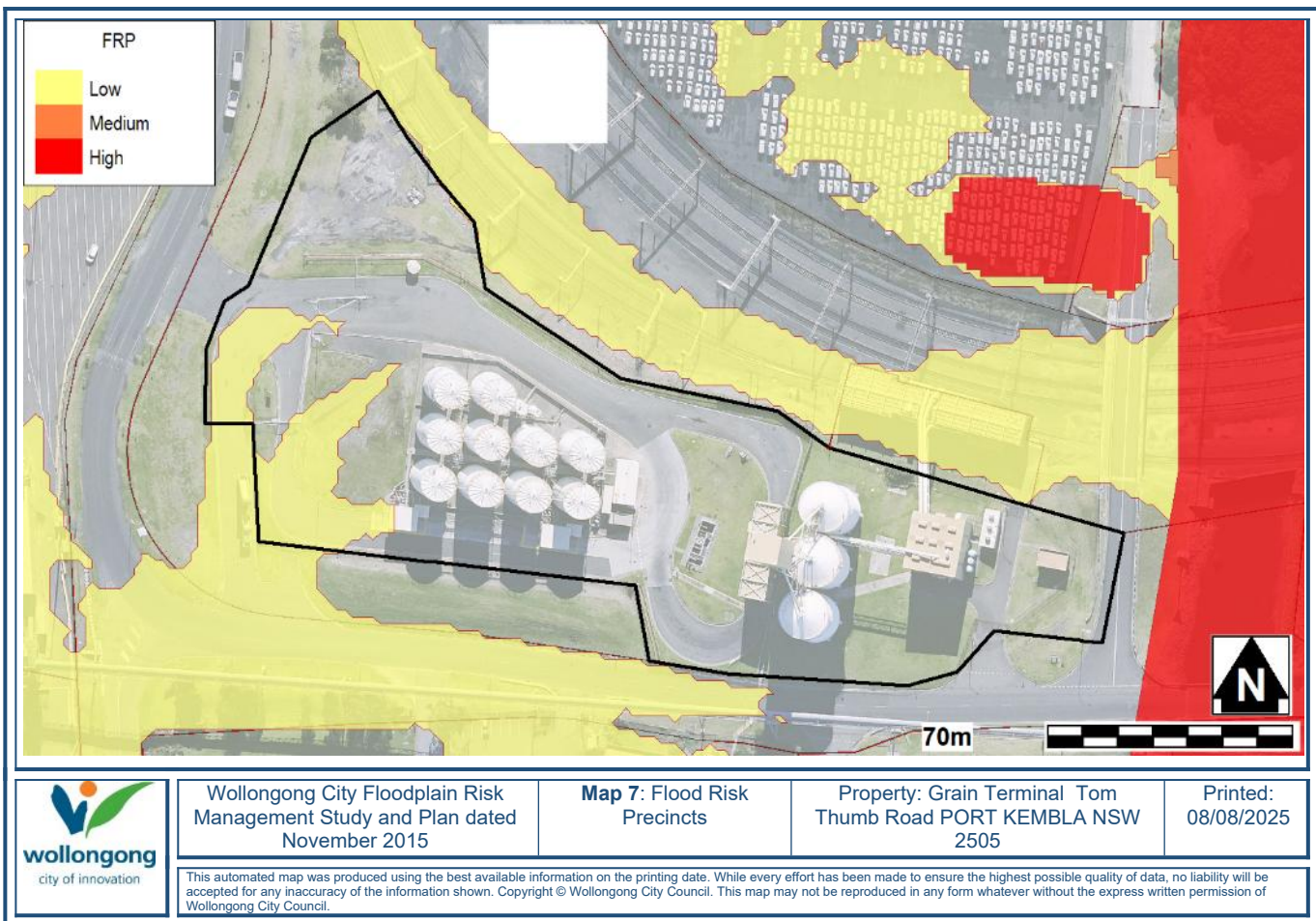
Property: Grain Terminal Tom
Thumb Road PORT KEMBLA NSW
2505

Printed:
08/08/2025

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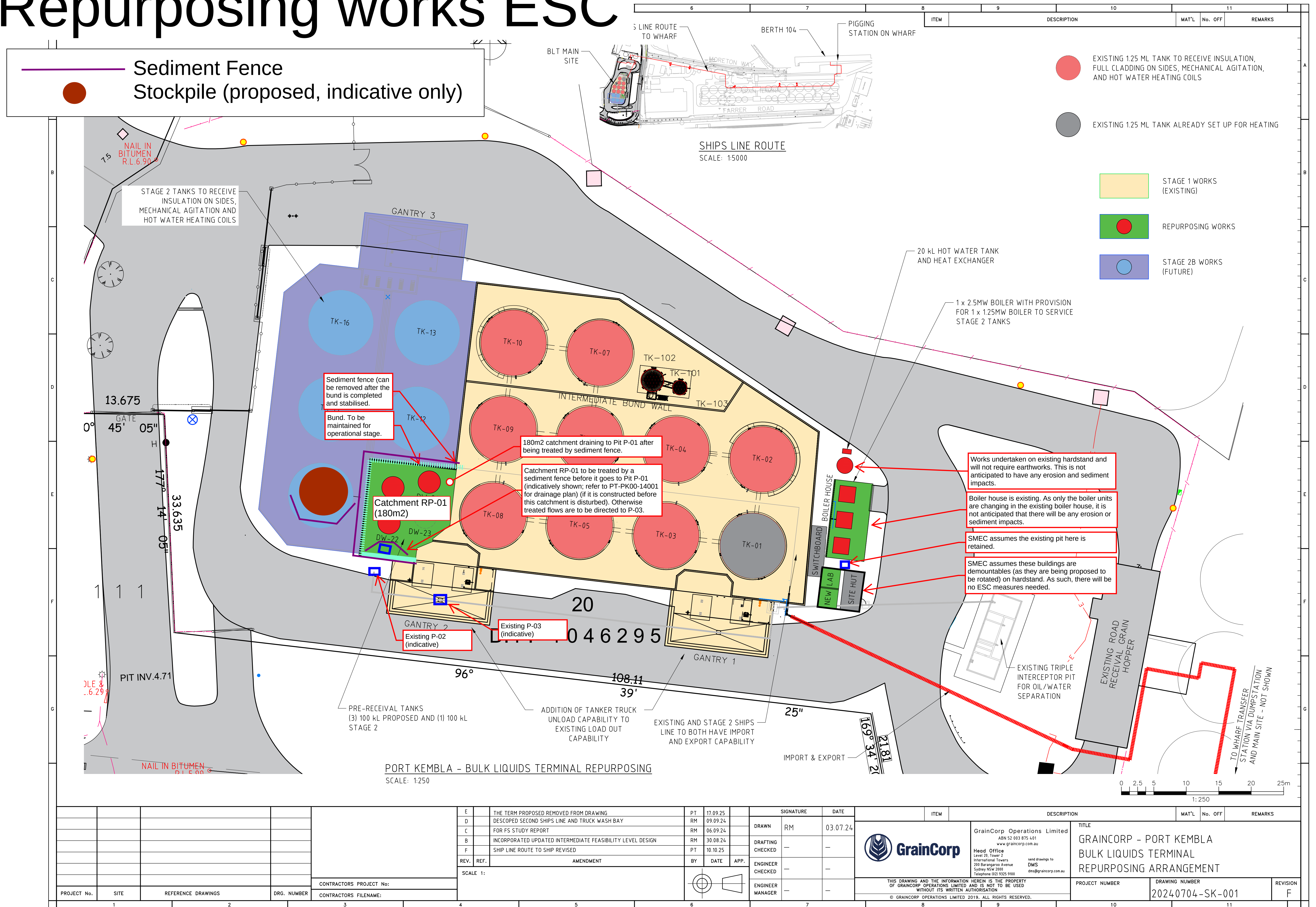




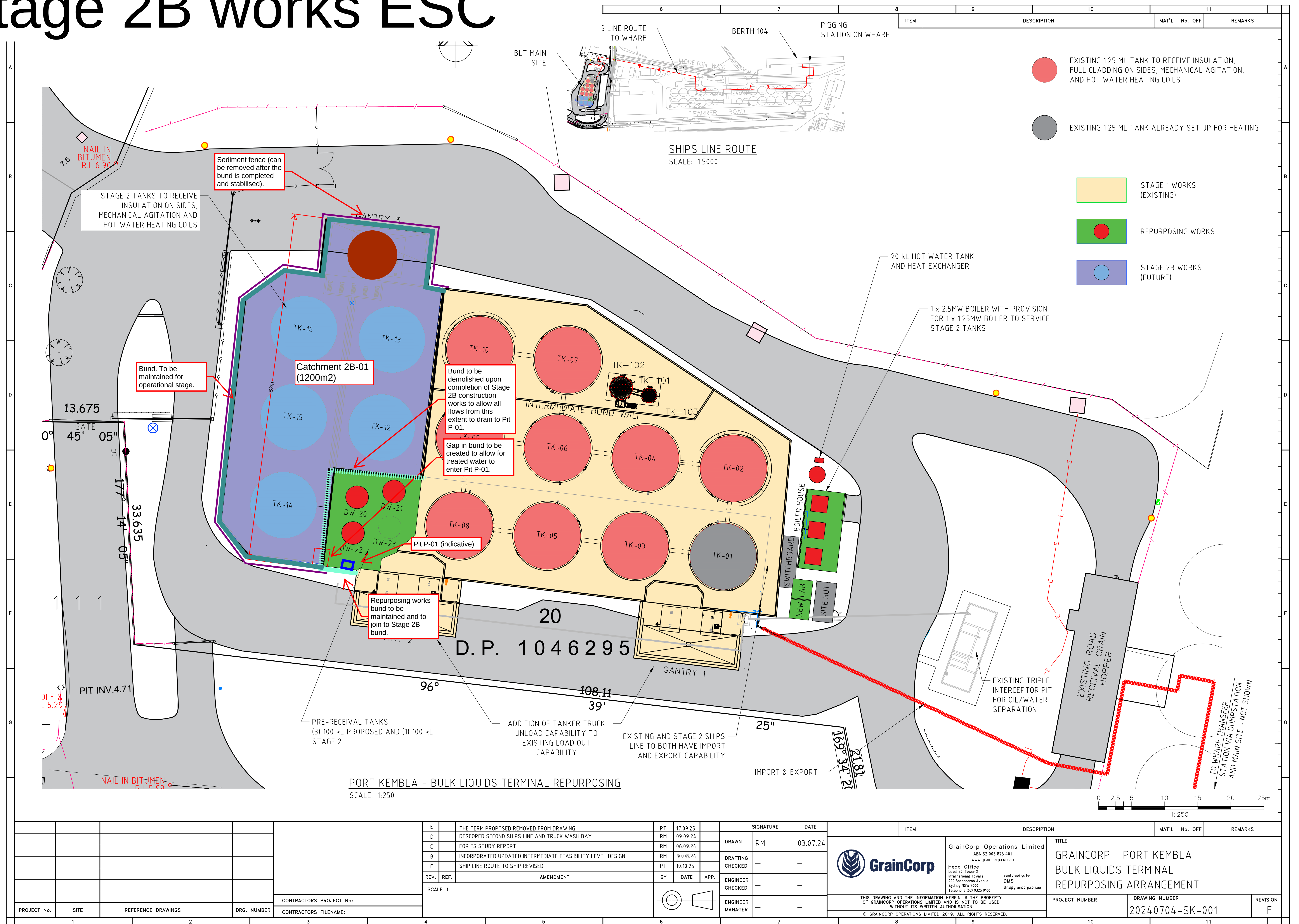
Appendix D

Erosion and Sediment Control for Proposed Works

Repurposing works ESC

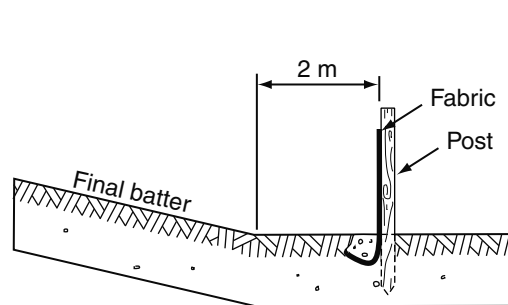


Stage 2B works ESC

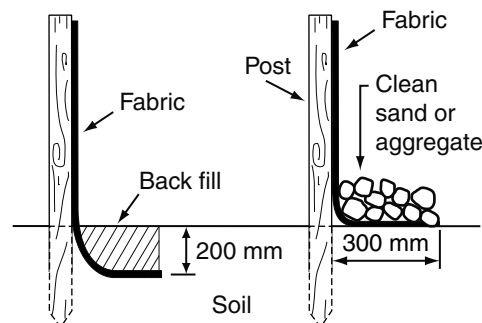


Appendix E

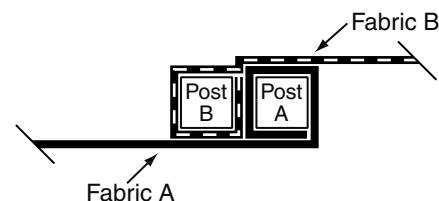
Standard Drawings for Erosion and Sediment Control



(a) Location of fence relative to base of slope

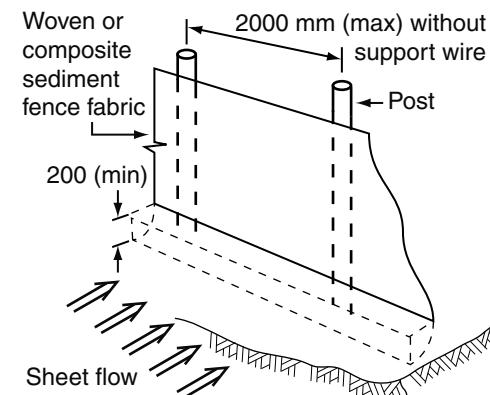


(b) Anchoring base of fabric

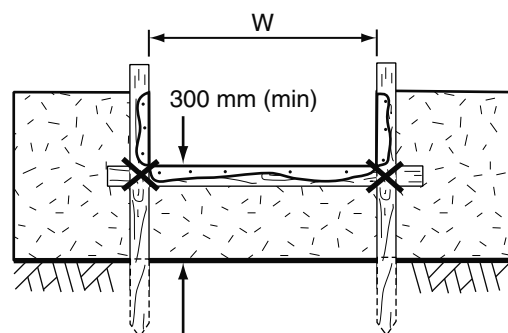


Fabric to fold around each stake one full turn.
Stake B to be drive tightly against Stake A.
The tops of both stakes to be secured with wire.

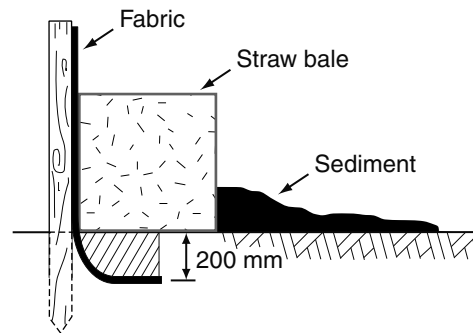
(c) Joining fabric - Method 1



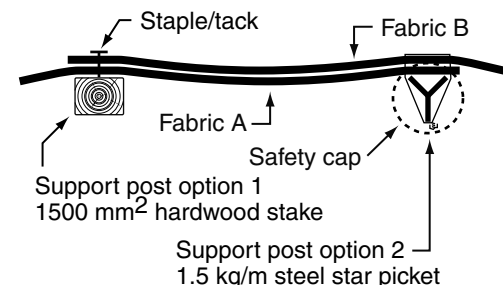
(d) Installation without backing support



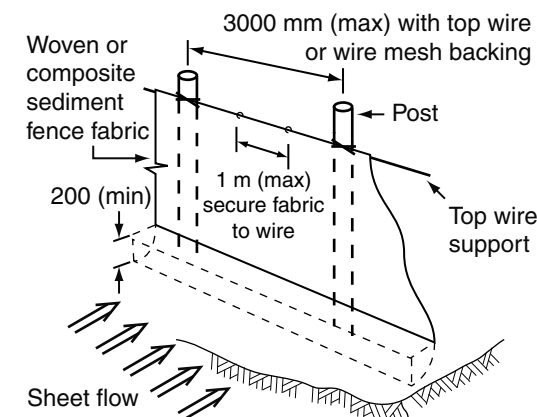
(e) Spill-through weir



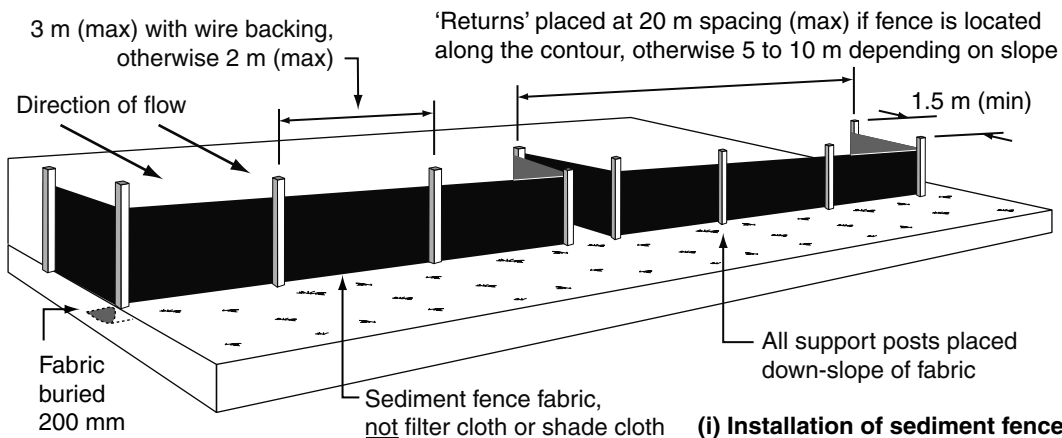
(f) Placement of up-slope straw bale



(g) Joining fabric - Method 2



(h) Installation with top wire support



(i) Installation of sediment fence

Notes:

1. Sediment fence to be installed along a line of constant ground elevation wherever practical.
2. Both end of the sediment fence to extend up the slope at least 1m.
3. Support post to be spaced a maximum 2m unless the fence is supported by a top wire or wire mesh backing, in which case 3m maximum spacing.
4. Fence 'returns' shall be installed at maximum 20m spacing if fence is installed along the contour, otherwise 5 to 10m maximum spacing.
5. Minimum 4 staples or tie wires per stake.

Drawn:	Date:		
GMW	Dec-09	Sediment Fence	SF-01

MATERIALS

FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700mm IN WIDTH AND A MINIMUM UNIT WEIGHT OF 140GSM. ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS AND STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE (ULTRAVIOLET STABILITY EXCEEDING 70%).

FABRIC REINFORCEMENT: WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200mm.

SUPPORT POSTS/STAKES: 1500mm² (MIN) HARDWOOD, 2500mm² (MIN) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE FOR ATTACHING FABRIC.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND REQUIRED TYPE OF FABRIC (IF SPECIFIED). IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, FABRIC TYPE, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. TO THE MAXIMUM DEGREE PRACTICAL, AND WHERE THE PLANS ALLOW, ENSURE THE FENCE IS LOCATED:
(i) TOTALLY WITHIN THE PROPERTY BOUNDARIES;
(ii) ALONG A LINE OF CONSTANT ELEVATION WHEREVER PRACTICAL;
(iii) AT LEAST 2m FROM THE TOE OF ANY FILLING OPERATIONS THAT MAY RESULT IN SHIFTING SOIL/FILL DAMAGING THE FENCE.

3. INSTALL RETURNS WITHIN THE FENCE AT MAXIMUM 20m INTERVALS IF THE FENCE IS INSTALLED ALONG THE CONTOUR, OR 5 TO 10m MAXIMUM SPACING (DEPENDING ON SLOPE) IF THE FENCE IS INSTALLED AT AN ANGLE TO THE CONTOUR. THE 'RETURNS' SHALL CONSIST OF EITHER:
(i) V-SHAPED SECTION EXTENDING AT LEAST 1.5m UP THE SLOPE; OR
(ii) SANDBAG OR ROCK/AGGREGATE CHECK

DAM A MINIMUM 1/3 AND MAXIMUM 1/2 FENCE HEIGHT, AND EXTENDING AT LEAST 1.5m UP THE SLOPE.

4. ENSURE THE EXTREME ENDS OF THE FENCE ARE TURNED UP THE SLOPE AT LEAST 1.5m, OR AS NECESSARY, TO MINIMISE WATER BYPASSING AROUND THE FENCE.

5. ENSURE THE SEDIMENT FENCE IS INSTALLED IN A MANNER THAT AVOIDS THE CONCENTRATION OF FLOW ALONG THE FENCE, AND THE UNDESIRABLE DISCHARGE OF WATER AROUND THE ENDS OF THE FENCE.

6. IF THE SEDIMENT FENCE IS TO BE INSTALLED ALONG THE EDGE OF EXISTING TREES, ENSURE CARE IS TAKEN TO PROTECT THE TREES AND THEIR ROOT SYSTEMS DURING INSTALLATION OF THE FENCE. DO NOT ATTACH THE FABRIC TO THE TREES.

7. UNLESS DIRECTED BY THE SITE SUPERVISOR OR THE APPROVED PLANS, EXCAVATE A 200mm WIDE BY 200mm DEEP TRENCH ALONG THE PROPOSED FENCE LINE, PLACING THE EXCAVATED MATERIAL ON THE UP-SLOPE SIDE OF THE TRENCH.

8. ALONG THE LOWER SIDE OF THE TRENCH, APPROPRIATELY SECURE THE STAKES INTO THE GROUND SPACED NO GREATER THAN 3m IF SUPPORTED BY A TOP SUPPORT WIRE OR WEIR MESH BACKING, OTHERWISE NO GREATER THAN 2m.

9. IF SPECIFIED, SECURELY ATTACH THE SUPPORT WIRE OR MESH TO THE UP-SLOPE SIDE OF THE STAKES WITH THE MESH EXTENDING AT LEAST 200mm INTO THE EXCAVATED TRENCH. ENSURE THE MESH AND FABRIC IS ATTACHED TO THE UP-SLOPE SIDE OF THE STAKES EVEN WHEN DIRECTING A FENCE AROUND A CORNER OR SHARP CHANGE OF DIRECTION.

10. WHEREVER POSSIBLE, CONSTRUCT THE SEDIMENT FENCE FROM A CONTINUOUS ROLL OF FABRIC. TO JOIN FABRIC EITHER:
(i) ATTACH EACH END TO TWO OVERLAPPING STAKES WITH THE FABRIC FOLDING AROUND THE ASSOCIATED STAKE ONE TURN, AND WITH

THE TWO STAKES TIED TOGETHER WITH WIRE; OR
(ii) OVERLAP THE FABRIC TO THE NEXT ADJACENT SUPPORT POST.

11. SECURELY ATTACH THE FABRIC TO THE SUPPORT POSTS USING 25 X 12.5mm STAPLES, OR TIE WIRE AT MAXIMUM 150mm SPACING.

12. SECURELY ATTACH THE FABRIC TO THE SUPPORT WIRE/MESH (IF ANY) AT A MAXIMUM SPACING OF 1m.

13. ENSURE THE COMPLETED SEDIMENT FENCE IS AT LEAST 450mm, BUT NOT MORE THAN 700mm HIGH. IF A SPILL-THROUGH WEIR IS INSTALLED, ENSURE THE CREST OF THE WEIR IS AT LEAST 300mm ABOVE GROUND LEVEL.

14. BACKFILL THE TRENCH AND TAMP THE FILL TO FIRMLY ANCHOR THE BOTTOM OF THE FABRIC AND MESH TO PREVENT WATER FROM FLOWING UNDER THE FENCE.

ADDITIONAL REQUIREMENTS FOR THE INSTALLATION OF A SPILL-THROUGH WEIR

1. LOCATE THE SPILL-THROUGH WEIR SUCH THAT THE WEIR CREST WILL BE LOWER THAN THE GROUND LEVEL AT EACH END OF THE FENCE.

2. ENSURE THE CREST OF THE SPILL-THROUGH WEIR IS AT LEAST 300mm THE GROUND ELEVATION.

3. SECURELY TIE A HORIZONTAL CROSS MEMBER (WEIR) TO THE SUPPORT POSTS/ STAKES EACH SIDE OF THE WEIR. CUT THE FABRIC DOWN THE SIDE OF EACH POST AND FOLD THE FABRIC OVER THE CROSS MEMBER AND APPROPRIATELY SECURE THE FABRIC.

4. INSTALL A SUITABLE SPLASH PAD AND/OR CHUTE IMMEDIATELY DOWN-SLOPE OF THE SPILL-THROUGH WEIR TO CONTROL SOIL EROSION AND APPROPRIATELY DISCHARGE THE CONCENTRATED FLOW PASSING OVER THE WEIR.

MAINTENANCE

1. INSPECT THE SEDIMENT FENCE AT LEAST WEEKLY AND AFTER ANY SIGNIFICANT RAIN. MAKE NECESSARY REPAIRS IMMEDIATELY.

2. REPAIR ANY TORN SECTIONS WITH A CONTINUOUS PIECE OF FABRIC FROM POST TO POST.

3. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.

4. IF THE FENCE IS SAGGING BETWEEN STAKES, INSTALL ADDITIONAL SUPPORT POSTS.

5. REMOVE ACCUMULATED SEDIMENT IF THE SEDIMENT DEPOSIT EXCEEDS A DEPTH OF 1/3 THE HEIGHT OF THE FENCE.

6. DISPOSE OF SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. REPLACE THE FABRIC IF THE SERVICE LIFE OF THE EXISTING FABRIC EXCEEDS 6-MONTHS.

REMOVAL

1. WHEN DISTURBED AREAS UP-SLOPE OF THE SEDIMENT FENCE ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, THE FENCE MUST BE REMOVED.

2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. REHABILITATE/REVEGETATE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.

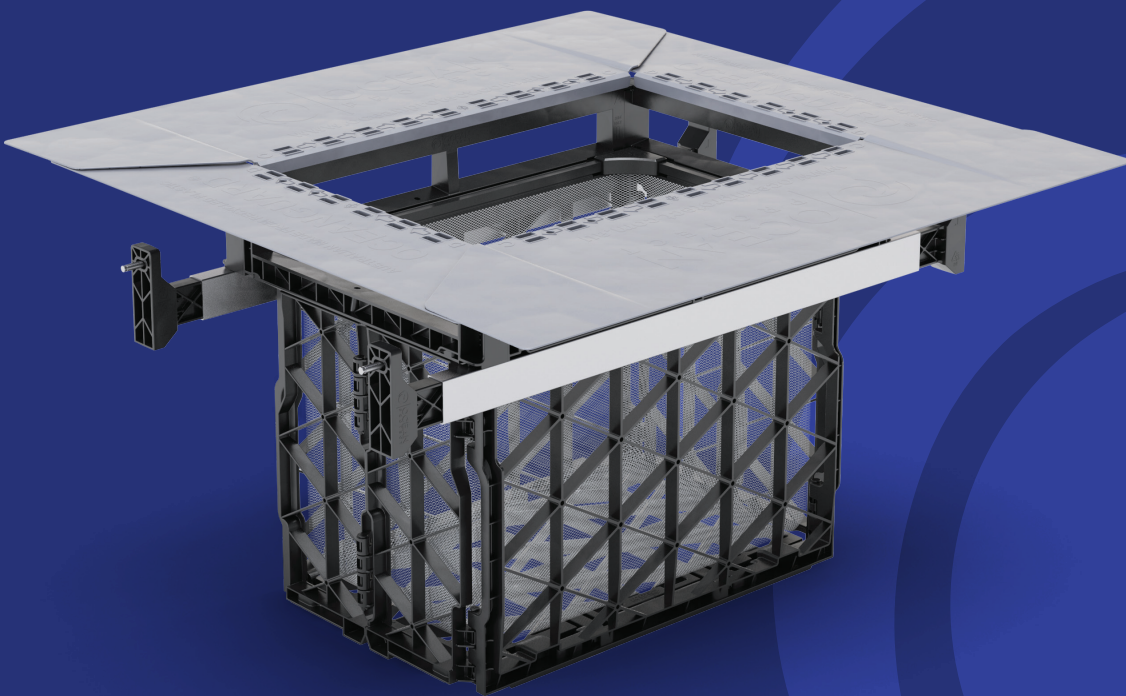
Drawn:	Date:		
GMW	Apr-10	Sediment Fence	SF-02

Appendix F

OceanGuard Product Brochures

OceanGuard®

Technical Design Guide



Stopping Pollution Entering Waterways



www.oceanprotect.com.au

Introduction	3
Operational Overview	4
Features	4
Configurations	5
Performance	6
Maintenance	6
Design Basics	7



Introduction

The OceanGuard® technology is a gully pit basket designed to fit within new and existing stormwater pits targeting pollution in stormwater runoff. The system is offered with a choice of filtration bag liners, designed to remove gross pollutants, total suspended solids and attached pollutants. It can be applied as a stand-alone technology or as part of a treatment train with our StormFilter® or Jellyfish® filtration products.

The filtration bag, filtration cage and flow diverter work together to maximise the flow treated, pollutant capture, hydraulic efficiency and ultimately retaining captured pollutants dry. OceanGuard® pit inserts are highly effective, easy to install and simple to maintain.

Operational Overview

The OceanGuard® is installed into field or kerb inlet gully pits. The flow diverter is made from recycled plastic waste and the flow diverter panels fit snug against the pit walls directing all incoming stormwater flows into the system.

The stormwater is then filtered via direct screening through the filtration bag liner ensuring that any debris larger than the openings in the filtration bag are captured and retained.

During large storm events, the water elevation in the filtration bag can rise and high flows are internally bypassed through overflow slots in the flow diverter frame.

At the end of the storm event, pollution is retained at the base of the filtration bag, where the pollution will start to dry until the next storm event.

Features

The OceanGuard® technology has the following features:

- **Flow Diverter:** Directs flow into the unit for filtration of stormwater and includes an in-built rigid bypass to divert stormwater overflows in high-intensity and peak storm flows
- **Filtration Bag:** Removable coarse (gross pollutant removal) and fine grade (200micron) filtration bags
- **Filtration Cage:** The supporting cage that allows for the use of larger filtration bags

The OceanGuard® can also be fitted with an oil/ hydrocarbon adsorbent material (optional) to capture and retain oil and grease. The adsorbent material is contained in socks that are designed to ensure maximum contact with stormwater as it enters the gully pit.

The OceanGuard® is designed to be easily retrofitted into new and existing stormwater pits, requiring no construction or land take. The OceanGuard® is often the most practical screening solution and reduces the pollutant load and maintenance burden on downstream infrastructure.

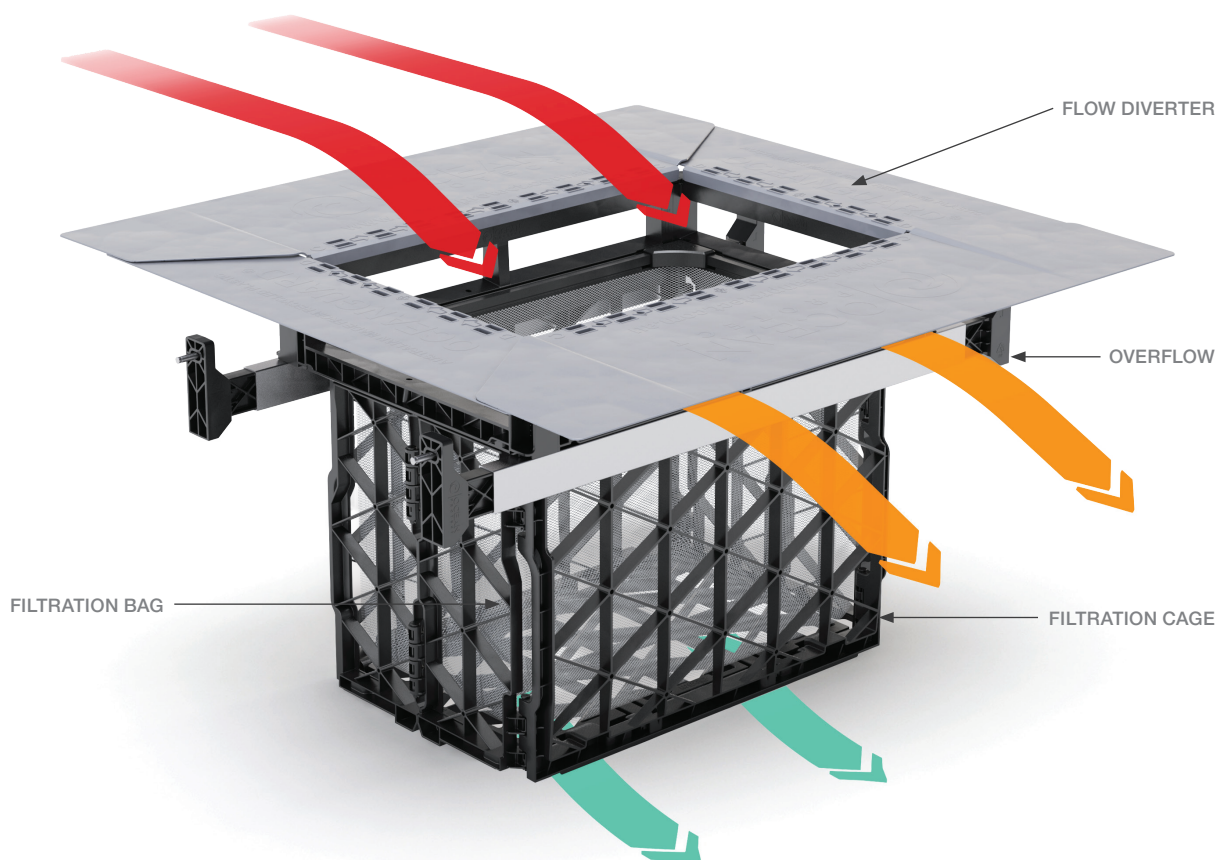


Figure 1: OceanGuard® components

Configurations

The OceanGuard® can fit a range of pits typically found in Australia including, kerb entry, rear entry with grated drain entry as well as field gully pits. There are multiple sizes to suit pits ranging in plan dimensions of 450 x 450mm – 1200 x 1200mm. Additional custom sizes are available to suit circular and non-standard pits.

The standard OceanGuard® configuration treats surface flow only (see Figure 2). In some instances, it may be necessary to treat pipe flow (see Figure 3). Ideally, the upstream catchment area to each basket should be no more than 1000m² (for maintenance, structural and hydraulic reasons).

Please note that the OceanGuard® technology is not a replacement for an in-line gross pollutant trap.

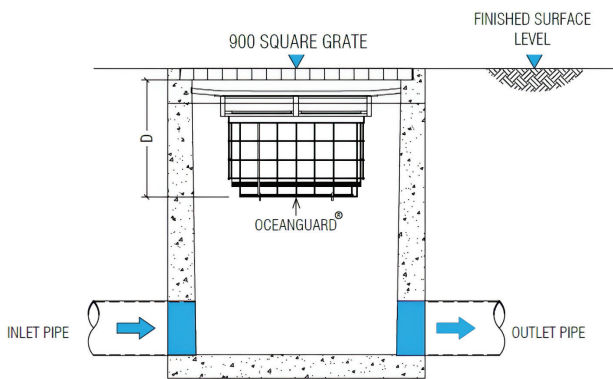


Figure 2: Standard configuration – surface flow

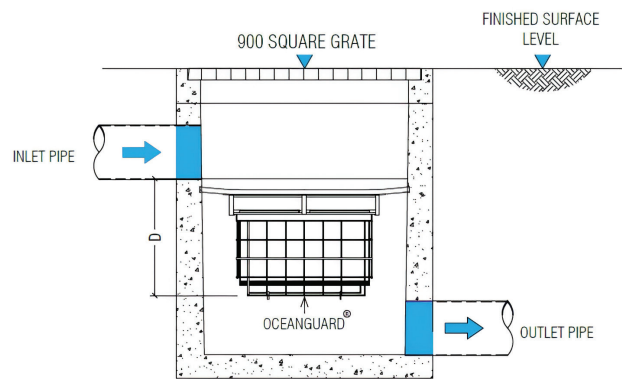
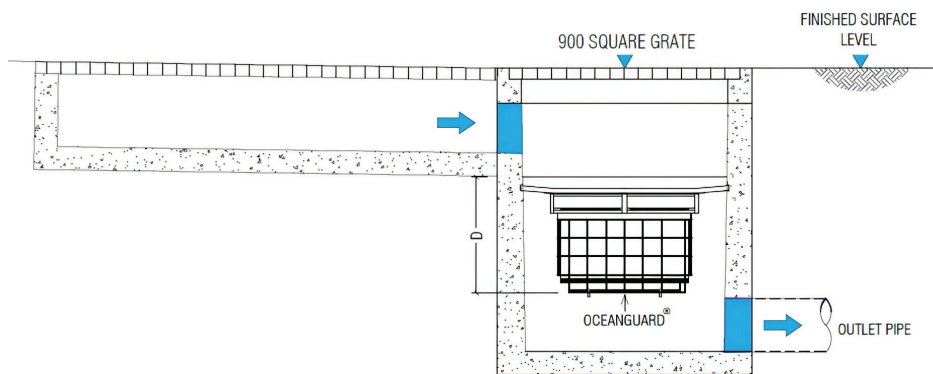


Figure 3: Example configuration – pipe flow

Another typical configuration required, is where the runoff collected by grated strip or trench drains needs to be treated (see Figure 4).



Performance

Typically, laboratory testing provides a means to generate hydraulic and basic performance data, but it should also be complemented with long-term field data. Gully pit baskets that operate under unrestricted flows require both a combination lab and field studies to accurately understand performance.

Ocean Protect has and is undertaking field testing locally in Australia. Further information on these studies is available in *A review of the application of OceanGuard® in Australia*.

Since 2001, the OceanGuard® (and previous generation Enviropod®) technology has been installed in a variety of applications to meet regulatory requirements set by authorities throughout Australia. Over 20,000 OceanGuard® (and previous generation Enviropod®) technologies have been installed within Australia by Ocean Protect. OceanGuard® has also been accepted by many of the most stringent stormwater quality regulators within other parts of Australia including Stormwater Australia Stormwater Australia Quality Improvement Device Evaluation Protocol (SQIDEP) verification, Blacktown City Council, Brisbane City Council and Gold Coast City Council.

Please contact your Ocean Protect representative to obtain the OceanGuard® approval status in your area.

Maintenance

Maintenance of the OceanGuard® is simple, effective and seldom requires confined space entry or specialised equipment, often being completed by hand without the need of vacuum equipment. Simply remove the OceanGuard® from the pit with the tags provided and invert the bag into a waste bin. Inspect the liner and brush by hand or spray with a pressure washer if required to rejuvenate the filtration bag. Record the information and replace the filtration bag.

Inspection & Cleaning

The OceanGuard® should be inspected at regular intervals from 1-2 months during the first year of installation to ensure optimum performance. The frequency at which the OceanGuard® will need to be maintained will depend on site activities, land uses, catchment area and this size of OceanGuard® installed, but is typically 3 to 4 times per year.

For further information please refer to the *OceanGuard® Operations and Maintenance Manual*.

Design Basics

The design requirements of any OceanGuard® system is detailed in 3 typical steps:

- 1 Hydraulic Design & Configuration
- 2 Water Quality Design
- 3 Mass Load Design

1 Hydraulic Design

All OceanGuard® must be designed to ensure that the hydraulic requirements of the system are met without adversely impacting the upstream hydraulics (limiting the likelihood of localised flooding).

2 Water Quality Design

Ocean Protect recommends and uses the widely endorsed Model for Urban Stormwater Improvement Conceptualisation (MUSIC), which makes it easy for correctly sizing an appropriate OceanGuard® system for your site.

A complimentary design service which includes MUSIC modelling is provided by the Ocean Protect engineering team. Simply email your project details to design@oceanprotect.com.au or alternatively you can always call one of our engineers for a discussion or to arrange a meeting in your office. The team will provide you with an efficient design containing details of the devices required to meet your water quality objectives together with budget estimates, product drawings and the MUSIC (.sqz) file.

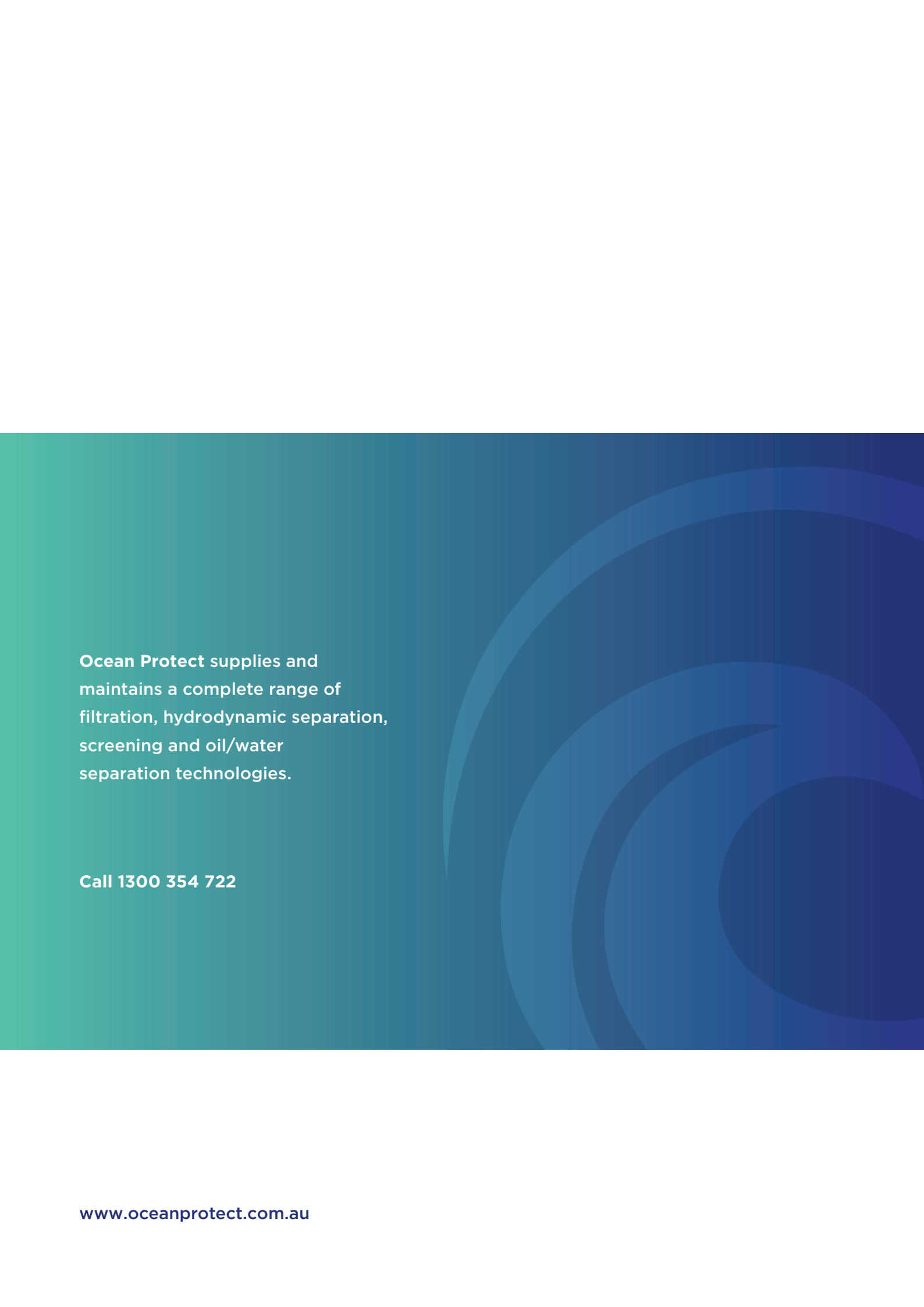
Alternatively, you can download the MUSIC treatment nodes for the Ocean Protect products from our website www.oceanprotect.com.au

When designing/modelling an OceanGuard® system for water quality purposes in MUSIC, a single GPT node is utilised. The GPT node is utilised with relevant removal efficiencies inserted. These parameters can vary based on the jurisdiction (authority) of your project, relevant details can be obtained from Ocean Protect. When modelling, the high-flow bypass is modified in node by adding the total number of OceanGuards installed and multiplying this number by 20L/s, eg. 10 x OceanGuards = 0.2m³/s.

All details such as drawings, specifications and maintenance manuals can also be downloaded for integration into your project's documentation. Additionally, the Ocean Protect team is available to review your model and provide additional assistance and guidance on the configuration of the OceanGuard® system(s) for your project.

3 Mass Load Design

Always be mindful of the magnitude of upstream catchment areas paying particular attention to perceived dirty or high loading sites. The Ocean Protect team can provide assistance and details on this process.



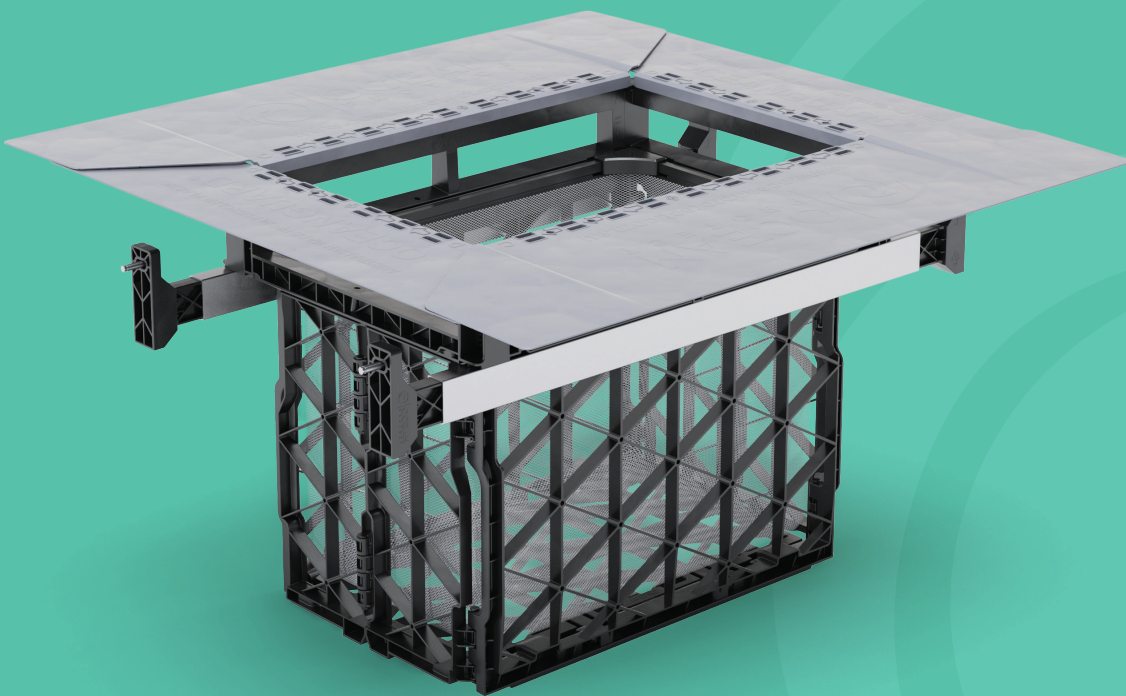
Ocean Protect supplies and maintains a complete range of filtration, hydrodynamic separation, screening and oil/water separation technologies.

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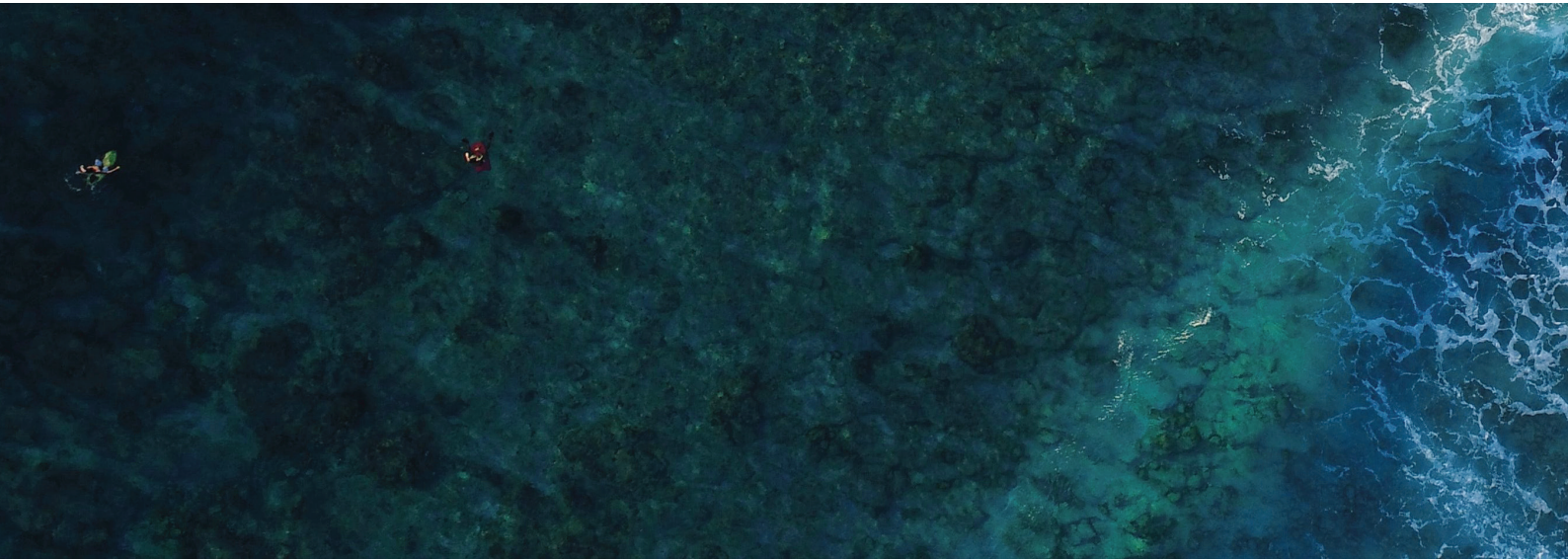
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OceanGuard®

Operations & Maintenance Manual



Stopping Pollution Entering Waterways



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Introduction	3
Health and Safety	4
How does it work?	5
Maintenance Procedures	6
Maintenance Services	7



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 for the OceanGuard® as recommended by the manufacturer (Ocean Protect).

The OceanGuard® technology is a gully pit basket designed to fit within new and existing gully pits to remove pollution from stormwater runoff. The system has a choice of filtration liners, designed to remove gross pollutants, solids, and other attached pollutants as either a standalone technology or as part of a 'treatment train' (e.g. with StormFilter®, Jellyfish® or biofiltration). OceanGuards are highly effective, easy to install and simple to maintain.

Stormwater professionals should note that Ocean Protect is not permitted to supply OceanGuard® technologies to provide pre-treatment to proprietary stormwater treatment assets that are not provided by Ocean Protect.

Why do I need to perform maintenance?

Adhering to the inspection and maintenance schedule of any stormwater treatment device is essential to ensuring that it functions 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 is 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), but most importantly ensures the long term effective operation of the OceanGuard®.

Health and Safety

Access to pits containing an OceanGuard® typically requires removing (heavy) access covers/grates, but typically it is not necessary to enter into a confined space. Pollutants collected by the OceanGuard® 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 sharp objects such as broken glass and syringes. For these reasons, there should be no primary contact with the waste collect and all aspects of maintaining and cleaning your OceanGuard® 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 OceanGuard®, 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.

The OceanGuard® is designed to be maintained from surface level, without the need to enter the pit. However depending on the installation configuration, location and site specific maintenance requirements it may be necessary to enter a confined space occasionally. 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 for confined space entry.

How does it work?

OceanGuard® is designed to intercept stormwater as it enters the stormwater pits throughout a site. The OceanGuard® has diversion panels that sit flush with the pit walls, this ensures that as stormwater enters at the top of the pit it is directed to the middle of the insert where the Filtration bag is situated. The filtration bag allows for screening to occur removing 100% of pollutants greater than the opening of the filtration material (200micron, 1600micron bags available).

During larger rain events the large flows overflow slots in the flow diverter of the OceanGuard® ensure that the conveyance of stormwater is not impeded thus eliminating the potential for surface flooding. As the flow subsides, the captured pollutants are held in the OceanGuard® filtration bag. The waste then starts to dry which reduces the magnitude of organic material decomposition transitioning between maintenance intervals.

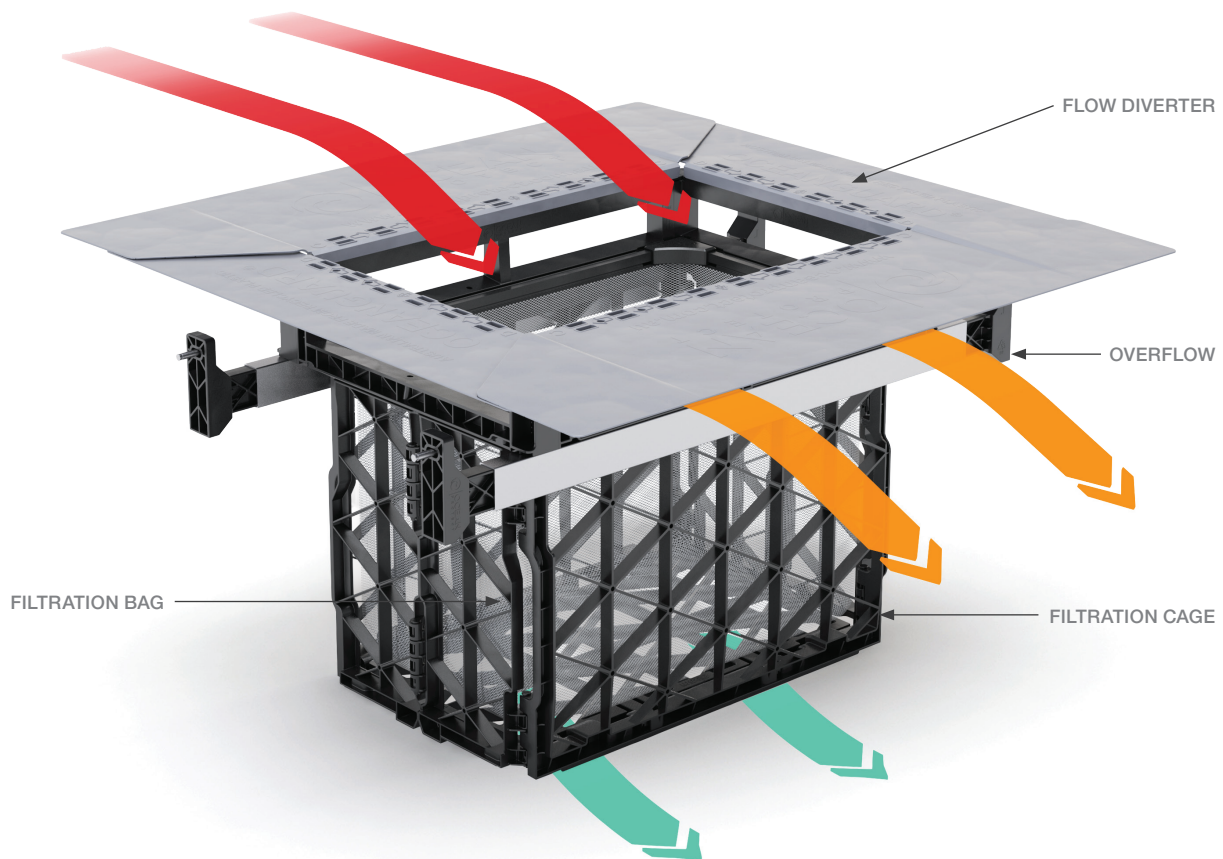


Figure 1: OceanGuard® components

Maintenance Procedures

To ensure that each OceanGuard® achieves optimal performance, it is advisable that regular maintenance is performed. The OceanGuard® requires 1-6 minor services annually (3 to 4 typical). Pending the outcome of these inspections, additional maintenance servicing may be required.

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 OceanGuard®.

Service Type	Description of Typical Activities	Frequency
Minor Service	Filter bag inspection and evaluation Removal of capture pollutants Disposal of material	1-6 Times Annually
Major Service	Filter Bag Replacement Support frame rectification	As required

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 return the OceanGuard® back to optimal operating performance. This type of service can be undertaken either by hand or with the assistance of a Vacuum unit.

Hand Maintenance

- 1 Establish a safe working area around the OceanGuard®
- 2 Remove access cover/grate
- 3 Use two lifting hooks to remove the filtration bag
- 4 Empty the contents of the filtration bag into a disposal container
- 5 Inspect and evaluate the filtration bag
- 6 Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
- 7 Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
- 8 Re-install filtration bag and replace access cover/grate

Vacuum Maintenance

- 1 Establish a safe working area around the OceanGuard®
- 2 Remove access cover/grate
- 3 Vacuum captured pollutants from the filtration bag
- 4 Remove filtration bag
- 5 Inspect and evaluate the filtration bag
- 6 Inspect and evaluate remaining OceanGuard® components (i.e. flow diverter, filtration cage and supporting frame)
- 7 Rejuvenate filtration bag by removing pollutant build up with a stiff brush, additionally the filtration bag can be washed using high pressure water
- 8 Re-install filtration bag and replace access cover/grate

Major Service (Filter Bag Replacement)

For the OceanGuard®, a major service is a reactionary process based on the outcomes from the minor service.

Trigger Event from Minor Service	Maintenance Action
Filtration bag inspection reveals damage	Replace the filtration bag ^[1]
Component inspection reveals damage	Perform rectification works and if necessary replace components ^[1]

^[1] Replacement filtration bags and components are available for purchase from Ocean Protect

Additional Types of Maintenance

Occasionally, 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, all OceanGuard® pits that potentially received flow should be inspected and cleaned. Specifically, all captured pollutants from within the filtration bag should be removed and disposed in accordance with any additional requirements that may relate to the type of spill event. All filtration bags should be rejuvenated (replaced if required) and re-installed.

Blockages

The OceanGuard's internal high flow bypass functionality is designed to minimise the potential of blockages/flooding and this configuration has been field proven for over twenty years. Flooding caused by an OceanGuard® style of pit basket is extremely rare and in the unlikely event that flooding occurs around the stormwater pit the following steps should be undertaken to assist in diagnosing the issue and implementing the appropriate response.

- 1 Inspect the OceanGuard® flow diverter, ensuring that they are free of debris and pollutants
- 2 Perform a minor service on the OceanGuard®
- 3 Remove the OceanGuard® to access the pit and inspect both the inlet and outlet pipes, ensuring they are free of debris and pollutants

Major Storms and Flooding

In addition to the scheduled activities, it is important to inspect the condition of the OceanGuard® after a major storm event. The inspection should focus on checking for damage and higher than normal sediment accumulation that may result from localised erosion. Where necessary damaged components should be replaced and accumulated pollutants disposed.

Disposal of Waste Materials

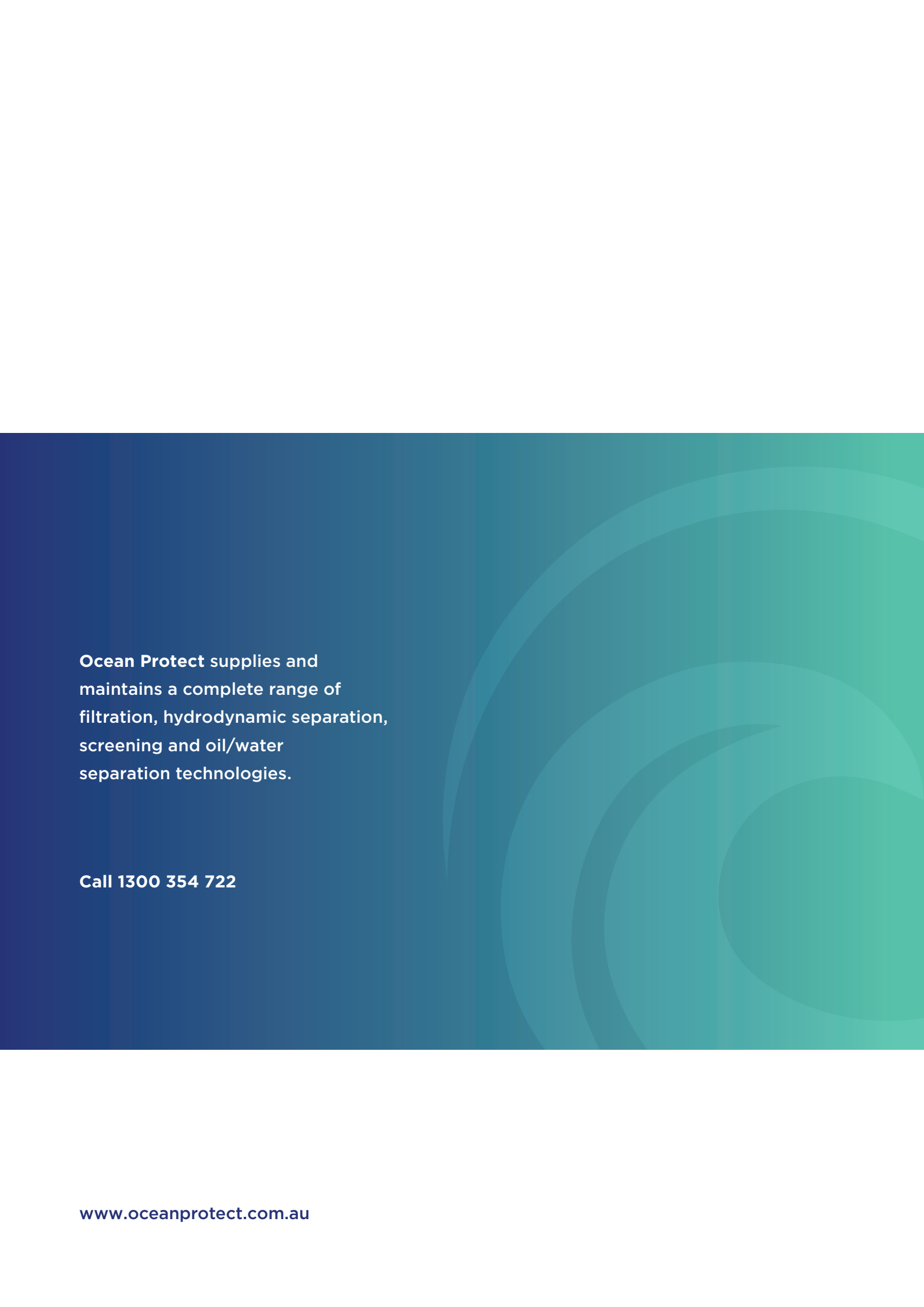
The accumulated pollutants found in the OceanGuard® must be handled and disposed of in a manner that is in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. If the filtration bag has been contaminated with any 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 our OceanGuard®, we offer long term pay-as-you-go contracts, pre-paid once off servicing and replacement filter bags.

**For more information please visit
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Appendix G

Bund Volume Capacities

Total floor area	2,069	m ²	from model / drawings
Tank base diameter	10.5	m	drawings
Tank base height	varies		extracted from 3D survey model - see table below
Tank diameter	10.0	m	drawings
Tank height	varies		extracted from 3D survey model - see table below
Average wall height	1.1	m	drawings

As bund floor level and tank base levels vary, banded area is divided into individual areas for each tank, in which the volume is derived from nominal floor height and tank base heights.

Slops and diesel tank footing area	33.6	m ²	
Average bund floor area at each tank	188.1	m ²	used to approximate the volume in table below

Gross volume (method 1)	2,276	m ³
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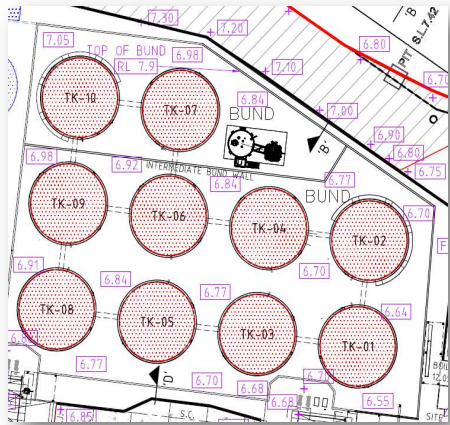
Gross volume (method 2) and displacements due to tanks:

	Tank base (foundation)		Tank		Total displacement	Bund gross volume alternate method	
	height of tank base above floor <i>from 3D model**</i>	volume displaced by tank base	"height" of tank (top of tank base to top of bund wall) <i>measured in 3D model*</i>	volume displaced by tank		depth of bund floor area at each tank <i>from 3D model **</i>	volume of each bund floor area
	m	m ³	m	m ³	m ³	(average)	m ³
Tank 1	0.54	47	0.74	58	105	1.28	241
Tank 2	0.53	46	0.69	54	100	1.22	230
Tank 3	0.53	46	0.69	54	100	1.22	230
Tank 4	0.55	48	0.60	47	95	1.15	217
Tank 5	0.55	48	0.60	47	95	1.15	217
Tank 6	0.55	48	0.52	41	89	1.07	202
Tank 7	0.56	48	0.48	38	86	1.04	196
Tank 8	0.55	48	0.53	42	89	1.08	204
Tank 9	0.55	48	0.47	37	85	1.02	192
Tank 10	0.46	40	0.48	38	78	0.94	177
slops and diesel tanks	0.23	8			8	1.07	202
		473		456	928		2,308

* heights vary around tank, approximate average value selected for each area
** tank base is sloped mid/lower points used

Net capacity	1,380	m ³
Net capacity (if nominal displaced volume of one tank is included)	1,420	m ³

Note: The latter value is often adopted by tank farm designers as a ruptured tank will not empty lower than level of bund wall.



Requirements	STAGE 2 (only)	STAGE 2 (including PRT)	
AS 1940:2017 requirements			
The greater of 110% of largest tank and 25% of total.			
Storage tanks qty	5 off	5 off	
Storage tanks volume	1250 m ³	1250 m ³	
PRT tanks qty		4 off	
PRT tanks volume		100 m ³	
Total stored volume	6250 m ³	6650 m ³	
25% of total	1563 m ³	1663 m ³	
110% of largest tank	1375 m ³	1375 m ³	
Required capacity per AS 1940	1563 m³	1663 m³	2017 version
EPA guidelines			
rainwater	96 mm	96 mm	95th percentile 5 day total (as suggested by EPA Manual)
volume lost to rainwater	95 m ³	113 m ³	higher rainfall volume could be considered if more conservative approach taken
firewater			
max firewater without brigade booster	1,080 L/min		20 minutes of fire water (as suggested by EPA Manual)
volume in 20 mins	22 m ³	22 m ³	
max firewater with brigade booster	1,680 L/min		
volume in 20 mins with brigade booster	34 m ³	34 m ³	
tank capacity			
110% of largest tank	1,375 m ³	1,375 m ³	
Required capacity per EPA	1,504 m³	1,522 m³	
Inputs			
Storage tank dia	10		assumes same as stage 1
Storage tank base dia	10.5		assumes same as stage 1
Storage tank base height	0.5		typical value for stage 1
Stage 2 area	991 m ²	991 m ²	from Scoping Sketch - Rev F
PRT area	0 m ²	186 m ²	from Scoping Sketch - Rev F
Total area	991 m²	1177 m²	
Calculations			
1 Required capacity			
greater of AS 1940 and EPA	1,563 m ³	1,663 m ³	
2 Bund volume displacements			
2.1 tank bases			
tank bases volume	216 m ³	216 m ³	
2.2 piping			
pipework volume allowance	6 m ³	6 m ³	roughly half of stage 1 major piping
pipe support footings allowance	10 m ³	10 m ³	roughly half of stage 1
2.3 volumes to top of tank bases (0.5m)			evaluate bund in 2 parts, this is the lower part
bund volume, gross	496 m ³	589 m ³	
bund volume, nett	263 m ³	356 m ³	
2.4			
volume required above tank base	1,299 m ³	1,306 m ³	
2.5 tanks			
tanks area	314 m ²	314 m ²	consider 4 tanks displacing, a ruptured tank does not occupy bund volume
bund area net of tanks	677 m ²	863 m ²	
wall height required above tank base	1.9 m	1.5 m	
3 wall height			
3.2 bund wall			
height to top of tank bases	0.5 m	0.5 m	
height from top of tank base to top of wall	1.9 m	1.5 m	
total wall height	2.4 m	2.0 m	



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