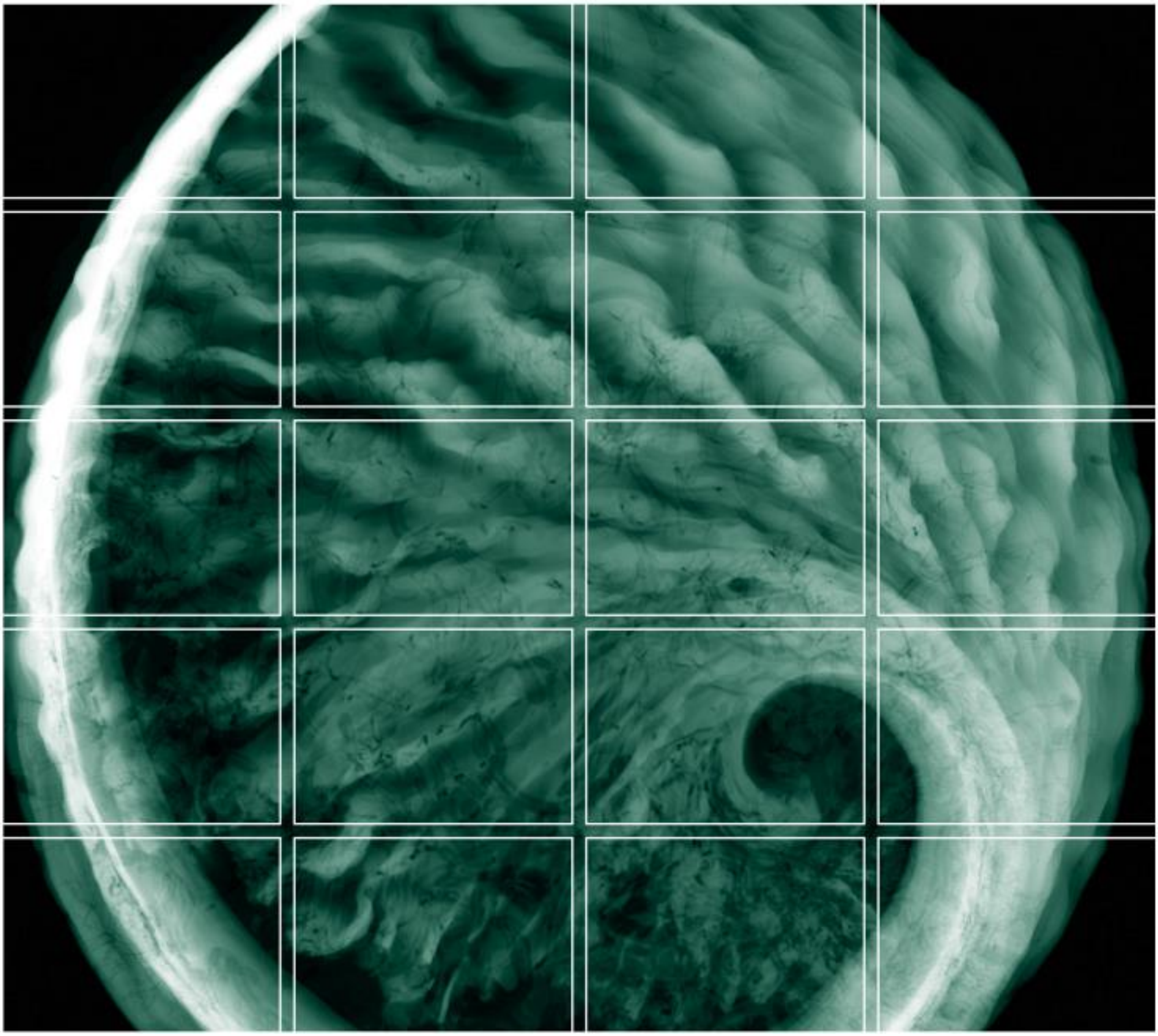

# Waste Metal Recovery, Processing and Recycling Facility 45 and 23- 43 Tattersall Road, Kings Park, Blacktown

*Storm Water Management Plan*

Sell and Parker Pty Ltd

June 2015

0226308

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# Waste Metal Recovery, Processing and Recycling Facility 45 and 23- 43 Tattersall Road, Kings Park, Blacktown

*Storm Water Management Plan*

| | |
|---|---|
| Prepared by: | *Stephen Mulligan* |
| Project Manager: | Senior Consultant |
| Signed: | |
| Date: | *19 June, 2015* |
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*Environmental Resources Management Australia Pty Ltd Quality System*

Sell and Parker Pty Ltd

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# 1 INTRODUCTION

## 1.1 SCOPE AND OBJECTIVES

Sell & Parker has submitted a Development Application for expansion of its current site at 45 Tattersall Road (Lot 5 /DP 7086) to include the neighbouring site 23-43 Tattersall Road (Lot 2, DP550 522). The DA is being processed as a State Significant Development (ref. SSD-5041). This Stormwater Management Plan was originally submitted as Annex J of the Environmental Impact Statement. It has been amended in response to feedback from NSW Environmental Protection Agency (NSW EPA).

This Stormwater Management Plan aims to provide for appropriate management of stormwater during both the construction and operational phases of the proposed development. It sets out requirements for stormwater management but does not provide full detailed design of the stormwater system, which will be developed at a later stage.

The Plan has been prepared to address the NSW EPA requirements by providing:

- consideration of alternatives to discharge;
- segregation of run-off from 'clean' and 'dirty' areas;
- identification of all pollutants that may pose a risk of non-trivial harm to human health or the environment, including concentrations, in untreated and treated waste water;
- containment and treatment of 'dirty' water to render it suitable for discharge to Breakfast Creek in consideration of the environmental values relevant to the watercourse and the potential risks associated with the proposed discharge;
- collection of clean rainfall for re-use, and reuse of suitable treated 'dirty' water to minimise mains water requirement; and
- management of the site to minimise the potential for contaminating stormwater.

This Plan also addresses the Director Generals Requirements (DGRs) relating to soil and water by providing:

- a detailed water balance for the development, outlining the measures to minimise water use and any potential for a sustainable water supply;
- wastewater predictions, and the measures that would be implemented to treat, reuse and/or dispose of this water;

- the proposed erosion and sediment controls during construction of the post fragmentation processing structure and any other proposed structures;
- the proposed stormwater management system; and
- consideration of the potential salinity, contamination, flooding and acid sulfate soil impacts of the development.

Blacktown City Council's requirements with respect to Blacktown's Development Control Plan are also taken into account in this Stormwater Management Plan. Blacktown's response to the NSW Department of Planning consultation on the Director General's Requirements resulted in the following requirements for stormwater management:

- Compliance with Blacktown Council DCP Part R – WSUD and Integrated Water Cycle Management, noting in particular the requirement for 80% of non-potable water use to be met using rainwater.
- Details of the existing detention/irrigation pond (the stormwater basin) including outlet details, removal rates, design capacity and operation. If the pond is deemed insufficient, the existing trapped sediment shall be removed and the pond restored to its original capacity.
- The proposed formalised car park on 58 Tattersall Road (assumed to refer to 23-43 Tattersall Road) must meet development controls in regards to stormwater quality outlined in Council's DCP Part R. This will also require the submission of an electronic MUSIC model to Council for review.
- The gap in the bund wall at the rear adjacent to Pick & Payless needs to be restored to the minimum levels elsewhere along the boundary.

ERM notes with particular reference to Blacktown City Council requirements that this Stormwater Management Plan is structured to meet NSW EPA requirements, and does not provide headings in accordance with the reporting requirements in Council's DCP Part R. We are confident that the Plan addresses the required content. We also note that improvements to the stormwater basin will result in substantially increased volume over the original and given the proposed changes the existing system is described in outline only, focussing on detail for the new system.

## 1.2 PROJECT LOCATION

Sell and Parker currently operate a waste metal recovery, processing and recycling facility at 45 Tattersall Road (Lot 5 DP 7086) Kings Park, within the Blacktown local government area (LGA), NSW. Number 23-43 Tattersall Road (Lot 2 DP 550522) immediately adjoins 45 Tattersall Road to the east and is the proposed location for the expansion of the metal recycling operation. 23-43 Tattersall Road is currently occupied by Dexion. Access to the sites is provided by Tattersall Road. Breakfast Creek is located immediately adjacent to the south of the two lots, with stormwater from 23-43 Tattersall Road being discharged to the watercourse. To the west of 45 Tattersall Road is a motor wreckers and to the east of 23-43 Tattersall Road is a rock and earth lined drainage channel which joins Breakfast Creek. Breakfast Creek is a tributary to Eastern Creek which then merges with South Creek, flowing to the Windsor Reach of the Hawkesbury River. The site locality is shown in *Figure 1 of Annex A*.

## 1.3 OVERVIEW OF THE PROPOSAL

Sell & Parker seeks approval for waste metal recovery, processing and recycling at its Blacktown metal recycling facility to a maximum of 350,000 tpa. It currently has approval for 90,000 tonnes per annum. To achieve this increased capacity it is proposed that the existing site at 45 Tattersall Road be reconfigured and expanded on to the adjoining lot (23-43 Tattersall Road).

The expanded site would enable Sell and Parker to utilise the available plant capacity in order to better respond to increasing demands, including community expectations for efficient and effective metal resource recovery and recycling facilities. It also provides the opportunity to considerably improve environmental management at the site, particularly with respect to stormwater. Key improvements include provision of a purpose built drainage and containment system, moving potentially polluting processes into roofed areas, providing bunded containment for potentially polluting activities and storage of hazardous materials, installing stormwater treatment and providing a purpose built system for reuse of stormwater.

### 1.3.1 Proposed Development

In summary, the proposed development is as follows:

- the existing office at 45 Tattersall Road will be demolished and relocated to improve safety and improve access to the shredder. The office functions will be relocated to the existing office situated at the front of the expanded site (23-43 Tattersall Road) to isolate pedestrians from the operational activities on the site;

- car parking for staff and visitors will be increased and moved adjacent to the new office on the expanded site (on 23-43 Tattersall Road) and isolated from the processing area of the facility;

- the pre-shedder will be relocated away from the boundary to where the shear is currently located on 45 Tattersall Road and a new shear will be located at 23-43 Tattersall Road;

- the existing post shredder non-ferrous recovery processing will be enclosed under roof to improve efficiency and reduce potential for noise and dust nuisance;

- parts of the existing building on 23-43 Tattersall Road will be demolished to make way for better circulation through the site;

- additional post shredder processing will be introduced to further extract remaining recyclables (metals and plastics) from floc material. This will involve conveying the floc via an enclosed conveyor after shredding to inside one of the existing buildings on the site (the Post Shredder Processing facility). The additional processing and storage of all floc will be located inside and hence reduce potential for noise and dust nuisance and which will prevent escape of this material and entrainment in run-off which currently occurs;

- the non-ferrous shed and non-ferrous processing will be relocated from the building on the existing site boundary to inside the remaining buildings on the expanded site to improve efficiency and reduce potential for noise and dust nuisance;

- the existing maintenance shed will be demolished and relocated to inside the existing Non Ferrous Shed. This will improve access to the shredder;

- the existing driveway entry at 23 -43 Tattersall Road will be used for retail non-ferrous customers so that they are kept isolated from the processing area of the facility;

- the current Sell and Parker entry driveway at 45 Tattersall Road will be widened so that two lanes of traffic can enter side by side at any time with two weighbridges installed so two customers can be served at the one time;

- the current exit driveway at 23-43 Tattersall Road will be widened and two weighbridges installed to handle more traffic volume;

- a new wheelwash will be installed on the exit driveway;

- the current Sell and Parker exit driveway at No 45 Tattersall Road will be closed and excavated to provide additional finished goods storage;

- part of the existing sound barrier wall and some vegetation will be removed between the two lots;
- a new bunded and separately drained truck wash facility will be installed within the existing building on the enlarged site;
- the existing site hardstanding will be cleared, cleaned and repaired as necessary to provide a complete, free draining surface;
- new dish drains will be installed in both sites to provide adequate drainage to all areas and reduce flood risk;
- the existing stormwater basin will be emptied, cleaned out, deepened, reprofiled and stabilised, relined if necessary and provided with concrete banking;
- primary, secondary and tertiary treatment plant for 'dirty' stormwater will be installed;
- A new 1400 tonne shear will be installed to replace the existing 20-year old 800 tonne shear.

A site layout plan for the proposed development is shown in *Figure 2* of *Annex A* .

## 1.4 *REGULATORY CONTEXT*

### 1.4.1 *Water Act 1912*

Section 10 of the *Water Act 1912* requires that:

> *(1) Any occupier of land whereon any work to which this Part extends (not being a joint water supply scheme) is constructed or used, or is proposed to be constructed or used, for the purpose of:*
>
> *(a) water conservation, irrigation, water supply or drainage, or*
>
> *(b) (Repealed)*
>
> *(c) changing the course of a river,*
>
> *May apply to the Ministerial Corporation in the form prescribed for a licence to construct and use the said work, and to take and use for the purposes specified in the application the water, if any, conserved or obtained thereby, and to dispose of such water for the use of occupiers of land for any purpose."*

*Implications for the Project*

As the works are not expected to intersect any water tables, require the irrigation of any water (other than water sprays for dust suppression), or change the course of any rivers, approval pursuant to Section 10 of the *Water Act 1912* is not required.

### 1.4.2 *Water Management Act 2000*

The *Water Management Act 2000* (WM Act) incorporates the provisions of various Acts relating to the management of surface and groundwater in NSW, and provides a single statute for the regulation of water use and works that affect surface and groundwater, both marine and fresh. The WM Act is administered by the NSW Office of Water (NOW).

Areas of the State where water sharing plans have commenced and apply are subject to the WM Act. Where water sharing plans have not commenced or do not specifically apply, the provisions of the *Water Act 1912* continue to apply.

The *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011* applies to the site and therefore the provisions of the WM Act apply.

The *Water Management Act 2000* (WMA) was introduced to provide for a comprehensive singular piece of legislation to effectively manage and regulate access, and use of, the state's water resources. The objectives of the WMA include:

- to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and the water quality; and
- to recognise and foster the significant social and economic benefits to the state that result from the sustainable and efficient use of water.

Chapter 3 part 3 of the WMA requires that approval be granted for works that are classified as "controlled activities" within waterfront land (generally being land within 40m of a waterway). A controlled activity is defined as:

*(a) the erection of a building or the carrying out of a work (within the meaning of the Environmental Planning and Assessment Act 1979), or*

*(b) the removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise, or*

*(c) the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or*

*(d) the carrying out of any other activity that affects the quantity or flow of water in a water source.*

Section 344(1)(a) provides that:

*1 A person must not:*

*(a) carry out a controlled activity in, on or under water front land otherwise than in accordance with a controlled activity approval.*

The site is located in close proximity to tributaries of Breakfast Creek which eventually flows into the Hawkesbury River. Given that the development is considered state significant, under the EP&A Act the development is exempt from requiring a controlled activity approval from the NSW Office of Water.

### *1.4.3 Existing Environmental Protection Licence (EPL)*

The site has an Environment Protection Licence (EPL) 11555 for the undertaking of the scheduled activity of scrap metal processing (0-100,000 tonnes processed). The EPL does not permit the discharge of polluted stormwater from the site.

Currently no surface water monitoring locations or discharge points are applicable to the site under EPL 11555.

Condition O7.1 of the EPL states that a Stormwater Management Scheme must be prepared for the development and must be implemented. Implementation of the Scheme must mitigate the impacts of stormwater runoff from and within the premises following the completion of construction activities. The Scheme should be consistent with the Stormwater Management Plan for the catchment. If a Stormwater Management Plan has not yet been prepared the Scheme should be consistent with the guidance contained in *Managing Urban Stormwater: Council Handbook* (available from the EPA). This Stormwater Management Plan is designed to fulfil this requirement.

It is proposed herein that the EPL should be modified to permit discharge in accordance with the Stormwater Management Plan. The proposed modifications are as follows:

Section P1 Location of monitoring and discharge points: stormwater monitoring and discharge points shall be as shown in Figure 3 of the Stormwater Management Plan.

Section L3 Concentration Limits: Concentration limits for stormwater discharge shall be as listed in Table 3.6 of the Stormwater Management Plan. Compliance with the limits shall be as specified in the notes to Table 3.6.

Section M2 Requirement to monitor concentrations of pollutants discharged: monitoring of stormwater discharge shall be conducted at monitoring point MP1 (Figure 3) in accordance with the monitoring program specified in Section 5.3 of the Stormwater Management Plan.

# 2 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

## 2.1 SITE CONDITIONS AND OPERATION

Sell & Parker's operation at 45 Tattersall Road comprises the following key activities:

- reception and unloading of incoming recyclable metals;
- drainage and containment of fluids (primarily oil and fuel from cars);
- size reduction as required by shear or oxy-cutting;
- pre-shredding and shredding;
- metal segregation and removal of 'floc' (shredded largely non-metal component);
- maintenance of site equipment;
- loading of outgoing processed metals; and
- removal of wastes (floc and waste oils etc, other non-recyclables).

There are few buildings on site, with the majority of the area being occupied by stockpiles, and the shredder / separation equipment. The site is accessed by incoming trucks via the access on the west, and exited at the east side, however trucks must return to the weighbridge on the west side prior to leaving which creates a certain amount of congestion.

ERM understands that the operational area is completely underlain by concrete hardstanding. During a site visit following heavy rainfall in April 2015, it was observed that there were many areas of standing water and drainage on the site is currently impeded by a poorly drained surface, stockpiles, and the quantity of sediment on the concrete. The site drains to a stormwater basin at the south end of the site, which provides for settlement and aeration of the stormwater. Water from the basin is pumped back to process areas for re-use, primarily to the hammermill for explosion prevention. There is no current discharge from the basin to Breakfast Creek.

## 2.2 CURRENT STORMWATER MANAGEMENT INFRASTRUCTURE

The site naturally drains towards Breakfast Creek to the south. Breakfast Creek is heavily disturbed ephemeral stream that flows through the industrial estate. The Creek is currently being reinstituted by local Council, involving realignment and lining with rock.

Stormwater runoff from all areas at Lot 5 DP 7086 (the existing site) currently reaches the stormwater basin in the southern portion of the site via overland flow and a network of inlets and underground pipes. This basin has a riser that acts a discharge point that is not licensed. The outlet for the riser is currently closed with a shut-off valve, with all captured stormwater to remain on-site. The basin walls have recently been raised to increase storage volume, following a period of unusually high rainfall. There is currently no stormwater treatment prior to water entering the basin. The basin provides for settlement, and a certain amount of aeration via a temporary pump with a fountain returning water to the pond.

The water in the basin is used for a variety of processing and site management requirements and this use is the primary means to control the water level in the basin. Water is pumped back to site via flexible hoses for use as required.

At the proposed expansion site (Lot 2 DP 550522) the predominant source of runoff is generated from the roof space occupying the majority of the site. Runoff from the northern part of the site (carpark and part of the office building) flows east via underground drains to the adjacent rock and earth lined stormwater drain to the east that links down gradient to Breakfast Creek. The southern portion of the site appears to drain direct to Breakfast Creek in the south.

## 2.3 *LANDFORM AND ELEVATION*

Lot 5 DP 7086 is a relatively flat site that drains to the south. The lot has been excavated into the landscape to allow for it to be sunk behind a noise wall in comparison to the elevation at street level. The site ranges from 41.7mAHD to 40.2mAHD just upgradient of the stormwater basin while the street level of Tattersalls Road is approximately 45mAHD. The stormwater basin bund height is approximately 43m AHD. A sound mound is constructed at street level to approximately 45-47mAHD in height. On the western boundary there is a retaining wall, with the elevation on the neighbouring site approximately 1m lower than the Sell & Parker site.

Lot 2 DP 550522 is also a relatively flat site that drains to the southwest of the site. The highest elevation is approximately 42mAHD in the northern carpark area of the site to the lowest point of around 40mAHD in the south western portion of the site (also a carpark). Tattersalls Road sits slightly higher than the site.

At present a vegetated mound travelling north-south separates the two lots. This will have to be removed to allow for the proposed expansion.

## 2.4 CLIMATE

Long term climate data is available from the Bureau of Meteorology network of automatic weather stations (AWS) located throughout the state. The weather stations utilised for the information within this report are listed in *Table 2.1*.

**Table 2.1 *Bureau of Meteorology Automatic Weather Stations referenced in this Report***

| Details | Purpose | |
|---|---|---|
| | **Temperature data** | **Rainfall data** |
| **Name** | Seven Hills (Collins St) | Quakers Hill Treatment Works |
| **Number** | 67026 | 67076 |
| **Year opened** | 1950 | 1948 |
| **Status** | Remains open | Remains open |
| **Co-ordinates** | Latitude: 33.77° S<br>Longitude: 150.93° E | Latitude: 33.74° S<br>Longitude: 150.88° E |
| **Elevation** | 50 m | 25 m |

### 2.4.1 *Temperature*

Temperature data from the Seven Hills (Collins Street) AWS reveals that for the period of collected data, on average:

- December is the warmest month of the year, with a mean temperature of 28.4 Degrees Celsius (°C); and
- the coolest months are June and July, with a mean temperature of 17.4°C (See *Table 2.2*).

**Table 2.2 *Monthly Temperature Data for Blacktown, NSW***

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Temperature (°C) | 28.3 | 27.7 | 27.0 | 24.1 | 20.0 | 17.4 | 17.4 | 18.6 | 21.4 | 23.8 | 26.3 | 28.4 | 23.4 |

1. Data sourced from Seven Hills (Collins Street) AWS (67026).

### 2.4.2 *Rainfall*

Rainfall data (1948-2013) from the Quakers Hill Treatment Works AWS reveals that for the period of collected data, on average:

- mean annual rainfall for the area surrounding the site is 921.5 millimetres (mm);
- September is typically the driest month with an average of 42.1mm; and
- February is typically the wettest month with an average of 113.3mm (See *Table 2.3*).

*Table 2.3 Monthly Precipitation Data for Blacktown, NSW, 1948-2013*

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average Rainfall (mm)** | 104.0 | 113.3 | 94.2 | 66.5 | 71.2 | 80.3 | 42.1 | 52.9 | 38.0 | 65.7 | 85.6 | 70.1 | 921.5 |
| **Maximum rainfall (mm)** | 415.3 | 444.2 | 345.5 | 370.8 | 389.9 | 469.4 | 206.8 | 436.7 | 144.0 | 195.8 | 309.4 | 210.1 | |

1. Data sourced from Quakers Hill Treatment Works AWS (67076)

## 2.5 GEOLOGY

The lithology of the site comprises shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff (Clark and Jones, 1991). The formation is Bringelly Shale of the Wianamatta Group (undifferentiated), from the Middle Triassic period (Clark and Jones, 1991).

## 2.6 SOIL LANDSCAPE

The Blacktown soil landscape group usually occurs on gently undulating rises over Wianamatta Group shales. The ground slopes are usually less than 5%. The soils range from shallow to moderately deep (less than 1m thick) and are hard setting, mottled textured clay soils. The soils are typically poorly drained with low fertility, localised high plasticity and expansive subsoils.

## 2.7 POTENTIAL ACID SULPHATE SOILS

Potential acid sulphate soils (PASS) are naturally occurring sediments and soils containing iron sulphides (principally pyrite) and/or their precursors or oxidation products. The exposure of the sulphides to oxygen by drainage or excavation leads to the formation of actual acid sulphate soils (ASS) and generation of sulphuric acid which can have unacceptable environmental impacts, including acidification of waterways, major fish kills, habitat destruction, loss of agricultural productivity, geotechnical instability and corrosion of concrete and steel structures.

PASS are concentrated in coastal environments, typically within estuarine sediments of relatively recent (Holocene and Pleistocene) age and at elevations mostly less than 5m AHD. There is however potential for other acid sulphate materials (ASM) (e.g. rocks containing sulphide minerals) to have wider distribution in the landscape.

Assessment of the Australian Soil Resource Information System (CSIRO, 2006) mapping layer identified that the site has no known occurrence of Acid Sulphate Soil (ASS).

# 3 SURFACE WATER QUALITY AND FLOW

## 3.1 ENVIRONMENTAL VALUES

### 3.1.1 *Breakfast Creek*

Breakfast Creek is described by Blacktown City Council's State of the Waterways Management Plan 2005 as part of the Hawkesbury-Nepean Catchment with a total area of 2248Ha and 62% total catchment imperviousness. The predominant land use is residential within the catchment, however there is significant heavy industry, and the catchment is regarded as the 3rd most polluted in the City of Blacktown. The stream is channelized to a large extent, and Council considers the stream condition irreversibly changed.

Breakfast Creek is considered severely modified with few significant natural values in terms of both habitat and longitudinal connectivity. Riparian vegetation is scattered or non-existent. It is likely to support limited ecological diversity. Blacktown Council's management plan includes a programme of improvement measures for Breakfast Creek, including enhancing vegetation corridors and seeking to control and improve industrial and sewage plant discharges as far as possible. Adjacent to the site, Council is currently carrying out significant works to the channel including cutting back and stabilising the banks with a rock wall. This significant earthwork is likely to be temporarily affecting local water quality, however it will also have the effect of increasing the stream's capacity and reducing flood risk.

Recent analytical data for the water quality in Breakfast Creek immediately upstream of the site is presented in *Tables 3.1* and *3.2* below. The full dataset is presented in *Annex B*, and sample point is shown on Figure 3.

***Table 3.1 Breakfast Creek Metal Results – Upstream of Site***

| Sample Date | Lead** µg/l | Aluminium µg/l | Arsenic µg/l | Cadmium** µg/l | Copper** µg/l | Nickel** µg/l | Zinc** µg/l |
|---|---|---|---|---|---|---|---|
| **ANZECC 2000 95%** | 34 | 55 | 13 | 0.95 | 4.99 | 29 | 22 |
| 09/2014 | <1 | - | <1 | <0.1 | 3 | 2 | **27** |
| 12/2014 | 8 | **6100** | 4 | <0.1 | **17** | 7 | **75** |
| 04/2015* | <1 | **60** | 3 | <0.1 | **5** | <1 | **22** |

* Field filtered samples indicative of dissolved metals concentration

** values are hardness adjusted using mean hardness value of 142mg/L CaCO3

## *Table 3.2 Breakfast Creek Hydrocarbons and other organics*

| | | | Water Quality | | | | | | | Perfluorinated Compounds | Organics | TRH NEPM (1999) | | BTEXN | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Temperature** | **pH (Lab)** | **Dissolved Oxygen** | **Redox** | **Electrical Conductivity @ 25°C** | **TDS** | **TSS** | **PFOS** | **Oil and Grease** | **TRH C6-C9 Fraction** | **TRH >C10-C36 Fraction** | **Benzene** | **Toluene** | **Ethylbenzene** | **Xylene (o)** | **Xylene (m & p)** | **Xylene Total** | **BTEX** | **Naphthalene** |
| | | | °C | pH units | mg/L | mV | µS/cm | mg/L | mg/L | µg/L | mg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| EQL | | | 0.1 | 0.01 | 0.1 | 0.1 | 1 | 10 | 5 | 0.002 | 5 | 20 | 50 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **ANZECC 2000 FW 95%--** | | | - | - | - | - | - | - | - | - | - | - | - | 950 | - | - | 350 | - | - | - | 16 |
| **Field ID** | **Sample Date** | **Area** | | | | | | | | | | | | | | | | | | | |
| STREAM 3 | 1/09/2014 | Up Stream | - | - | - | - | - | - | 10 | - | - | <20 | <50 | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <1 |
| BREAKFAST CK | 12/12/2014 | Up Stream | - | 7.88 | 7.6 | 185 | 534 | - | 159 | 0.046 | 5 | <20 | <50 | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <2 |
| STREAM 3 | 22/04/2015 | Up Stream | 16.6 | 7.83 | 9.09 | 80.3 | 315.7 | 242 | 30 | 0.044 | <5 | <20 | <50 | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <1 |

Note: - ANZECC value not available

Data on the flows in Breakfast Creek in the vicinity of the site does not appear to be available. ERM notes that Breakfast Creek receives stormwater discharges from multiple sources in the area, with a likely very high impervious percentage. Consequently it is likely that peak flows are very high. The Creek did not flood either 45 or 23-43 Tattersall Road during April 21st and 22nd 2015, during exceptional rainfall conditions resulting in April 2015 being one of the highest rainfall months since 1948.

### *3.1.2 South Creek*

The South Creek subcatchment encompasses South Creek and Eastern Creek that are downstream of Breakfast Creek and comprises most of the Cumberland Plain of Western Sydney.

The catchment is a shale-based catchment with no gorges or sandstone dominated landscapes. The majority of the streams are "meandering vertical" river channel types streams, which are under great threat as they are confined largely to the Cumberland Plain in the Hawkesbury Nepean catchment.

South Creek subcatchment is perhaps the most degraded subcatchment in the Hawkesbury Nepean. Hydrological and sediment regimes have been dramatically altered due to vegetation clearance and increasing urbanisation. Increasing impervious surfaces in the catchment are causing changes to hydrology which has greatly altered the geomorphology and ecology of the watercourses.

A number of major Sewerage Treatment Plants discharge into South Creek and these, along with stormwater from urban areas and agricultural runoff, contribute to the poor water quality of the streams.

The recovery potential of the catchment's streams is very low; however, there are some very important remnants of endangered vegetation along the riparian zones. The watercourses form extremely important habitat corridors although heavy woody weed invasion exists in the riparian zones (CMA Hawkesbury-Nepean, 2013).

### *3.1.3 Hawkesbury River*

The Hawkesbury River in this location is under threat from a multitude of land use impacts. The river receives highly reduced flows due to extensive upstream impoundment for Sydney's drinking water. Licensed surface water extraction from this subcatchment is also high, supporting the most intensive and productive agricultural operations in the Sydney basin. The floodplains and riverbanks have been largely cleared for agriculture and recreational use, and riverbank erosion is a serious issue.

There are a number of major Sewerage Treatment Plants discharging into the Hawkesbury River subcatchment which impact on water quality and flow.

The Hawkesbury River has an extremely high social and economic value supporting significant agriculture, recreation and tourism industries in the subcatchment, and there is a very high level of community based environment activity zones (CMA Hawkesbury-Nepean, 2013).

### 3.1.4 *NSW Water Quality and River Flow Objectives*

The NSW government has set up the NSW Water Quality and River Flow Objectives (WQRFO), which are agreed environmental values and long-term goals for NSW surface waters. The objectives are consistent with the agreed national framework for assessing water quality set out in the ANZECC 2000 Guidelines. Surface waters from the site enter Breakfast Creek, which flows to Eastern Creek which ultimately flows to the Hawkesbury River. This catchment forms part of the Hawkesbury River Catchment under the WQRFO.

At the time the environmental objectives were approved by the Government (September 1999) the Healthy Rivers Commission (HRC) had substantially completed public inquiries for the catchment of the Hawkesbury-Nepean River. The HRC recommended Water Quality Objectives in its Final Reports for these catchments. Government confirmed these Objectives in its response to the reports in Statements of Intent. The Statement of Joint Intent for the Hawkesbury Nepean River System (NSW Government 2001) identified the following Water Quality Objectives (WQOs) in Table 3.3 that should be adopted as criteria for the initial phases of an adaptive management regime for water quality.

For other substances, the ANZECC guidelines should be adopted.

*Table 3.3 Water Quality Objectives for Nutrients*

| Water Quality Indicator (all values µg/L) | Forested Areas and Drinking Water Catchment | Mixed Use Rural Areas and Sandstone Plateau | Urban Areas – Main Stream | Urban Areas – Tributary Stream | Estuarine Areas |
|---|---|---|---|---|---|
| **Total Phosphorus** | | | | | |
| NWQMS range | 10-100 | 10-100 | 10-100 | 10-100 | N/A |
| HRC recommendation | **50** | **35** | **30** | **~50** | **30** |
| Measured range (a) | 7-50 | 10-740 | 10-100 | 50-360 | 15-30 |
| **Total Nitrogen** | | | | | |
| NWQMS range | 100-750 | 100-750 | 100-750 | 100-750 | N/A |
| HRC recommendation | **700** | **700** | **500** | **~1000** | **400** |
| Measured range (a) | 100-800 | 200-3200 | 400-2200 | 500-15,000 | 200-500 |

| Water Quality Indicator (all values µg/L) | Forested Areas and Drinking Water Catchment | Mixed Use Rural Areas and Sandstone Plateau | Urban Areas – Main Stream | Urban Areas – Tributary Stream | Estuarine Areas |
|---|---|---|---|---|---|
| **Chlorophyll-*a*** | | | | | |
| NWQMS range | N/A | N/A | N/A | N/A | 1-10 |
| HRC recommendation | **7** | **7** | **10-15** | **~20** | **7** |
| Measured range (a) | - | 2-7 | 3-20 | 2-70 | 5-9 |
| (a). The values shown are the range of average (mean) values calculated for the sites in that region. | | | | | |

### 3.1.5 *NSW And Blacktown Policy On Stormwater Discharge Quality And Quantity*

The Sell & Parker operation is regulated by NSW EPA under an EPL which currently permits no discharge of polluted water from 45 Tattersall Road. 23-43 Tattersall Road discharges stormwater without requirement for a discharge consent because it does not carry out a potentially polluting activity at present. The NSW EPA generally prefers that stormwater discharges comply with water quality trigger values for freshwater provided by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000) (herein referred to as ANZECC 2000). Most urban waterways, including Breakfast Creek, fall into the category of "slightly to moderately disturbed" ecosystems, to which trigger values for protection of 95% of species apply. In addition, Blacktown Council DCP Part R requires percentage reductions in post development annual loads of pollutants as follows:

- Gross pollutants 90%
- Total suspended solids 85%
- Total phosphorus 65%
- Total nitrogen 45%
- Total hydrocarbons 90%

NSW EPA has indicated that any discharge from the site shall only be permitted in the event that it can be shown to result in no "non-trivial harm" to health or the environment.

With respect to permissible volume of discharge, Blacktown Council requires that the post development duration of stream-forming flows shall be no greater than 3.5 times the pre developed stream-forming flows (Stream Erosion Index).

## 3.2 SITE STORMWATER QUALITY AND QUANTITY

### 3.2.1 *Potential Contaminants*

The activities on-site have the potential to generate the following contaminants which may have potential to enter stormwater on site:

- Sediment (potentially contaminated with any of the below);
- oil, gasoline and diesel fuel;
- transmission fluid, power steering fluid and brake fluid;
- machinery lubricants and grease;
- battery acid and solvents;
- metals, including aluminium, cadmium, copper, lead, mercury, iron and zinc

### 3.2.2 *Quality Of Stormwater For Treatment*

Analytical data representing the water quality in the stormwater basin is summarised below in *Tables 3.4* and *3.5*. The full dataset is presented in *Annex B*.

## *Table 3.4 Retention Pond - Metals*

| Field ID | Sample Date | Area | Lead** | Lead (filtered) ** | Aluminium | Aluminium (filtered) | Arsenic | Arsenic (filtered) | Cadmium** | Cadmium (filtered) ** | Chromium | Chromium (filtered) | Copper** | Copper (filtered) ** | Nickel** | Nickel (filtered) ** | Zinc** | Zinc (filtered) ** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Metals** | | | | | | | | | | | | | | | |
| | | | µg/l | µg/l | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| EQL | | | 1 | 1 | 10 | 10 | 1 | 1 | 0.1 | 0.1 | 0.1 | 0.1 | 1 | 1 | 1 | 1 | 5 | 5 |
| **ANZECC 2000 FW 95%** | | | 34 | 34 | 55 | 55 | 13 | 13 | 0.95 | 0.95 | 1 | 1 | 4.99 | 4.99 | 29 | 29 | 22 | 22 |
| S1 | 18/11/2013 | Retention Pond | **301** | 5 | **1420** | 50 | - | - | - | - | **16** | **2** | **210** | 1 | 21 | 10 | **1840** | **25** |
| Pond 2 | 1/09/2014 | Retention Pond | **164** | - | - | - | 3 | - | **1.1** | - | **6** | - | **35** | - | 15 | - | **670** | - |
| POND_1 | 1/09/2014 | Retention Pond | **257** | - | - | - | 4 | - | **1.7** | - | **12** | - | **57** | - | 19 | - | **974** | - |
| HOLDING POND | 12/12/2014 | Retention Pond | 27 | - | **360** | - | 2 | - | 0.3 | - | **2** | - | **10** | - | 11 | - | **203** | - |
| POND_1 | 22/04/2015 | Retention Pond | - | <1 | - | 20 | - | <1 | - | <0.1 | - | **1** | - | <1 | - | <1 | - | **91** |

**Note: metals ** are hardness adjusted using mean hardness value of 142mg/L CaCO3**

## *Table 3.5 Retention Pond - Organics*

| Field ID | Sample Date | Area | Temperature | pH (Lab) | Dissolved Oxygen | Redox | Electrical Conductivity @ 25°C | TDS | TSS | PFOS | Oil and Grease | TRH C6-C9 Fraction | TRH >C10-C36 Fraction | Benzene | Toluene | Ethylbenzene | Xylene (o) | Xylene (m & p) | Xylene Total | BTEX | Naphthalene |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | °C | pH units | mg/L | mV | µS/cm | mg/L | mg/L | µg/L | mg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| EQL | | | 0.1 | 0.01 | 0.1 | 0.1 | 1 | 10 | 5 | 0.002 | 5 | 20 | 50 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **ANZECC 2000 FW 95%** | | | - | - | - | - | - | - | - | - | - | - | - | 950 | - | - | 350 | - | - | - | 16 |
| S1 | 18/11/2013 | Retention Pond | - | - | - | - | - | - | 1040 | - | 4700 | 50 | 851,000 | <1 | 5 | <2 | 3 | 5 | 8 | 13 | 6 |
| DAM SPRAY | 14/04/2014 | Retention Pond | - | - | - | - | - | - | - | - | - | <20 | 4100 | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <5 |
| Pond 2 | 1/09/2014 | Retention Pond | - | - | - | - | - | - | 64 | - | - | 40 | 2100 | <1 | 6 | <2 | 3 | 4 | 7 | 13 | <1 |
| POND_1 | 1/09/2014 | Retention Pond | - | - | - | - | - | - | 102 | - | - | 40 | 1890 | <1 | 6 | <2 | 4 | 4 | 8 | 14 | 1.1 |
| HOLDING POND | 12/12/2014 | Retention Pond | - | 7.76 | 7.2 | 195 | 779 | - | 32 | 10.4 | 8 | <20 | 380 | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <2 |
| POND_1 | 22/04/2015 | Retention Pond | 18.1 | 7.73 | 3.2 | 74.7 | 597 | 410 | 19 | 5 | 6 | <20 | 550 | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <1 |

Note: - not analysed (for analytes) or not available (ANZECC value)

ERM notes that there has been significant improvement in the water quality since the earliest sample in 2013, particularly with respect to hydrocarbons but to some extent also metals and total suspended solids (likely related). The improvement is considered to be a result of improvements undertaken by the site to improve oil containment in process areas, and by introducing aeration pumping. Consequently, recent results are considered better representation of the likely worst-case water quality requiring treatment (with the exception of gross pollutant and sediment loading since these samples represent settled conditions).

The reason for inclusion of analyses of perfluorinated compounds (PFCs) is as a result of a fire which occurred in November 2014 in the hammermill, and which was attended by the fire brigade. The PFCs are used in fire fighting foams, and these were used in extinguishing the fire. Temporarily elevated concentrations of PFCs have been present in the stormwater, and likely remain present due to remnant PFC content in site sediment.

Following cleaning of the site surface and clean out of the stormwater lagoon during the redevelopment, there will be a very low risk that ongoing PFC contamination would be present. It is noted however that trace PFCs are present in the environment very commonly (as is seen in the Breakfast Creek samples).

Sediment loads prior to entering the stormwater basin have not been measured, however it is predicted that sediment removal from stormwater will continue to be required post-development.

### *3.3 STORM WATER DISCHARGE QUALITY CRITERIA*

As part of its application, Sell and Parker will be seeking (following consent) alteration to the existing EPL to allow for discharges to Breakfast Creek from the stormwater basin on Lot 5 DP 7086. Such an alteration would require the allocation of a licensed discharge point and the establishment of discharge criteria for relevant pollutants. Compliance monitoring will be required. Discharge criteria are proposed in *Table 3.6* below.

*Table 3.6 Proposed Discharge Criteria*

| Analyte | Units | LOR | ANZECC 2000 95% | Breakfast Creek upgradient | Discharge limit | Source / rationale for limit |
|---|---|---|---|---|---|---|
| Oil and Grease | mg/L | 5 | NA | 5 | 5 | Detection limit / Breakfast Creek background |
| pH | pH units | | NA | 7.88 | 7-8 | Breakfast Creek range |
| TSS | µg/L | 5 | NA | 10-159 | 50 | Breakfast Creek background |
| Total P | mg/L | 0.01 | NA | 0.18 | 0.2 | Hydrosystem performance |
| Total N | mg/L | not tested | NA | not tested | 500 | Hawkesbury River Catchment objective for main streams |
| PFOA | µg/L | 0.002 | NA | 0.034 | 0.05 | Breakfast Creek background |
| PFOS | µg/L | 0.002 | NA | 0.046 | 0.05 | Breakfast Creek background |
| Benzene | µg/L | 1 | 950 | <1 | 1 | Breakfast Creek background |
| Xylene (o) | µg/L | 2 | 350 | <2 | 1 | Breakfast Creek background |
| BTEX | µg/L | 1 | NA | <1 | 1 | Detection limit / Breakfast Creek background |
| Naphthalene | µg/L | 1 | 16 | <2 | 16 | ANZECC 2000 |
| Aluminium | µg/L | 10 | 55 | 60-6100 | 55 | ANZECC 2000 |
| Arsenic | µg/L | 1 | 13 | <1-4 | 13 | ANZECC 2000 |
| Cadmium* | µg/L | 0.1 | 0.95 | <0.1 | 1 | Hydrosystem performance |
| Chromium (total)** | µg/L | 1 | 1 | 3-9 | 50 | Hydrosystem performance |
| Copper * | µg/L | 1 | 4.99 | 3-17 | 50 | Hydrosystem performance |
| Lead * | µg/L | 1 | 34 | <1-8 | 34 | ANZECC 2000 |
| Manganese | µg/L | 1 | 1900 | 26-172 | 200 | Breakfast Creek background |
| Mercury | µg/L | 0.1 | 0.6 | <0.1 | 0.6 | ANZECC 2000 |
| Molybdenum | µg/L | 1 | NA | <1-1 | 1 | Breakfast Creek background |
| Nickel * | µg/L | 1 | 29 | 2-7 | 29 | ANZECC 2000 |
| Strontium | mg/L | 0.001 | NA | 0.101 - 0.169 | 0.2 | Breakfast Creek background |
| Zinc * | µg/L | 5 | 22 | 22-75 | 50 | Hydrosystem performance |

Table notes

*ANZECC value hardness adjusted using mean $CaCO_3$ hardness for Breakfast Creek, 142mg/L

** ANZECC value for chromium is applicable to hexavalent Cr not total Cr – no value for total Cr is given

NA = not available

The discharge limit proposed applies to the annual mean of the results from samples over a 12 month period. No single sample shall exceed 150% of the discharge limit.

The proposed discharge criteria have been determined based on the following:

1. The ANZECC (2000) freshwater trigger values for slightly to moderately disturbed systems (95% species protection), corrected for hardness in accordance with the guidelines;

2. Blacktown Council requirements for post development reduction in total suspended solids, total P, total N and total hydrocarbons;

3. Upstream quality of Breakfast Creek;

4. Performance capability of proposed tertiary treatment (SPEL Hydrosystem 1500)

The rationale adopted was that the discharge should result in no non-trivial harm to the receiving water and should comply with Blacktown Council requirements. Where compliance with the ANZECC 2000 value is within the capability of available stormwater treatment plant, the ANZECC 2000 value is proposed as a discharge limit, except in cases (such as benzene and xylene) where the ANZECC 2000 is significantly above the Breakfast Creek background value, in which case the Breakfast Creek background is selected. Discharge limits consistent with Breakfast Creek background concentrations are also proposed where Breakfast Creek water quality exceeds the ANZECC 2000 criteria, or where no ANZECC 2000 value is available.

There are five analytes (total phosphorus, cadmium, copper, chromium and zinc) where suitable treatment plant capable of guaranteeing compliance with the ANZECC 2000 value and/or Breakfast Creek background could not be sourced. In the case of total phosphorus and cadmium, the difference is a small fraction of the ANZECC 2000 value, and it is considered insignificant. For copper, chromium and zinc the difference is significant enough to require further consideration in terms of the potential for non-trivial harm.

The proposed treatment system described in detail in *Section 5* (comprising primary, secondary and tertiary treatment together with significant holding capacity) is considered to the best available on the market for this application, which requires ability to minimise discharge and treat effectively in normal conditions at a relatively low flow rate, and also operate during high rainfall events to prevent the requirement for direct discharge (ie, bypassing tertiary treatment) up to a 1 in 100 storm event. The discharge limits proposed are the lowest levels for which the manufacturer can provide test data to demonstrate performance. It may be possible to achieve higher water quality than the demonstrated performance, however this will not be known until after commissioning and testing the system.

The stormwater management plan has adopted the following measures designed to minimise discharge from the potentially contaminated catchments and maximise treatment performance:

- Separate containment and off-site disposal for waste waters in the potentially most contaminated locations ("contaminated drainage", Figure 3).
- 8064$m^3$ of stormwater holding capacity.
- Oversized tertiary treatment plant permitting highest treatment rate achievable at maximum flow without compromising optimum performance. This solution also permits longer residence times compared to a smaller unit, which should increase performance on metals removal. The model selected can also be retrofitted with additional filters to improve organics removal if necessary.

### *3.4 ENVIRONMENTAL RISK FOR PROPOSED DISCHARGE QUALITY*

The best available treatment system has been specified, and combined with the maximum practicable stormwater retention volume to provide for minimising the pollutant loading discharged to Breakfast Creek, and minimising the frequency with which an untreated discharge must occur as a result of extreme rainfall events.

Sell & Parker has investigated the potential for discharge of stormwater to Sydney Water sewer system as an alternative to on site treatment. The volume that Sydney Water is likely to be able to accept is insignificant in comparison to the total requirement for tertiary treatment of the stormwater. It was concluded that this option would not significantly alter the requirement for the site to provide for tertiary treatment and stormwater retention. Consequently, discharge to sewer is considered to offer no environmental benefit and this was discarded as an option for treating stormwater from the site's "dirty" catchment. It was retained as a possibility for discharging water from the separately contained "contaminated" locations, as an alternative to off-site disposal.

There are two areas of potential environmental risk to discuss: firstly the effect of potential exceedances of the ANZECC 2000 trigger values for copper, chromium and zinc and secondly the effect of the untreated overflow at storms exceeding the 1 in 100 year flows. In all other respects, the discharge criteria proposed are compliant with the regulatory requirements and preferences detailed in *Section 3.1.5*.

### 3.4.1 *Risk associated with copper, chromium and zinc discharge*

Discharge of treated stormwater may contain concentrations of copper (Cu), chromium (Cr) and zinc (Zn) that are in excess of Breakfast Creek background concentrations, and in exceedance of the ANZECC (2000) trigger value. It is noted that ANZECC (2000) does not provide a trigger value for total Cr but does provide one for hexavalent Cr (Cr VI) which is adopted. A low reliability value for Cr III of 3.3ug/L is provided by ANZECC (2000); adoption of this value would make little difference to the potential for exceedance.

ANZECC (2000) (Section 2.2.1.9) states that trigger values for water quality are not designed for direct application to discharge consents or stormwater quality, and that they should not be used in that way. The purpose of the guidelines is to apply to the ambient waters that receive discharges, to protect the environmental values represented by those waters. The guidelines do not include the concept of mixing zones. A mixing zone is an area of the receiving watercourse which provides dilution for an effluent. The aim of management and treatment of an effluent should be to minimise the size of the mixing zone, and ensure that the environmental values of the receiving water are not compromised.

During normal conditions, discharge of treated water to Breakfast Creek is predicted to occur at optimum flow rate for 2-4 days per month on average. The need for discharge will always follow rainfall, and therefore it is unlikely that discharge will occur during low flow conditions. The need for higher rate discharge will occur only when intense rainfall is occurring or has recently occurred, and Breakfast Creek flow will at these times be comparably high. Flow rates in Breakfast Creek are not currently available, and calculation of mixing zone ranges is therefore not possible.

Reference to *Table 3.4* shows that when dissolved metal concentrations are considered (and correctly ANZECC 2000 trigger values apply to dissolved content only, because this is the bioavailable fraction), the existing retention basin water does not exceed the ANZECC 2000 values for Cu. The dissolved Cr concentration is 1-2ug/L compared to an ANZECC trigger value of 1ug/L, and the dissolved Zn concentration is 25-91ug/L compared to a trigger value of 22ug/L and a treatment performance of 50ug/L. On this basis, the maximum likely exceedance of the ANZECC value for the normal discharge would be a factor of 2 for each analyte.

Further, the background concentration in Breakfast Creek is comparable to the dissolved concentrations in the retention basin for all three analytes.

Therefore, there is considered to be no significant risk that non-trivial environmental harm could result.

### 3.4.2 *Risk associated with discharge of untreated stormwater*

Discharge of untreated stormwater will not occur under normal operating conditions. The stormwater retention basin is sized for capacity to retain a 1 in 100 year storm event, adopting a reasonable worst-case assumption that the site is not using water during the event but that the tertiary treatment plant continues to operate. For these conditions, the 48 hour event is the critical duration, and it is predicted that the pond volume of 8064$m^3$ will have remaining capacity of 230$m^3$ at its fullest.

If untreated discharge becomes necessary (in the event of a more extreme event than 1 in 100 year return, or as a result of the combination of an extreme event and breakdown of the tertiary treatment plant), the retention basin will overflow to Breakfast Creek via the overflow outfall which will be set at the basin's maximum height of 40.30m AHD. This is necessary to prevent flooding of the site. Overflow will cease as soon as the basin level falls below 40.30m AHD. Under these conditions it is likely that the site will not be operating, and that flows in Breakfast Creek from other sources will be extremely high. Very high flow conditions are considered to mitigate potential impacts from untreated discharge, since site derived contaminants would be both at maximum dilution and also moved downstream quickly to an even higher dilution.

## 3.5 *PROPOSED DISCHARGE RATES*

The discharge from the tertiary treatment system is predicted at a rate of 6L/s (21.6$m^3$/hr), which will occur under normal circumstances for an estimated average of 2-4 days per month, following rainfall. The maximum discharge rate from the treatment system will be 24L/s (86.4$m^3$/hr), and this will occur only in rain events where the retention basin fills to the high control level. How frequently this occurs depends on the set of the high control level, however it is unlikely to be more than once every 3-5 years.

Discharge from the clean catchment will not be retained, other than filling the rainwater tanks. Once the tanks are full the clean catchment will discharge into Breakfast Creek at a rate determined by rainfall intensity.

Currently the entire area of 23-43 Tattersall Road discharges directly without detention, and the proposed development will therefore result in a net reduction in discharge rate during rainfall.

The overall effect of the development will be to balance the flow rate into Breakfast Creek during and following rainfall, by reducing the discharge during rainfall and then releasing water at a slower rate over a period of several days. This should have a beneficial effect on flow in Breakfast Creek, reducing peak flow rates and helping make flow rate changes more gradual.

## 4 WATER BALANCE

### 4.1.1 Estimated Mains Water Requirements

An estimated average of 40 litres per person per working day is required for uses such as toilet and hand basin use, dishwashing, showering and drinking. Using this assumption the current 64 employees would consume an estimated 2,560 Litres/day (L/day). The predicted increase to 80 employees associated would raise water usage rates to approximately 3,200L/day. Assuming 304 working days per year this equates to 972.8kL/year.

It is considered that rainwater harvesting and reuse of stormwater from the basin will be sufficient to meet 100% of process requirements under normal conditions. Under very dry conditions, use of mains water could be needed temporarily however this would be exceptional.

### 4.1.2 Process water requirements

Process water is currently supplied primarily from the stormwater basin. The main activities capable of using recycled water on the site include:

- explosion prevention within the hammermill (the majority of which is expelled from the process as steam);
- dust suppression within the conveyor;
- washdown of areas required for pedestrian and truck movements and work areas outside of stockpile locations;
- general dust suppression on the site.

The site estimates that the combined use of recycled water is approximately 100m$^3$ per day, which is sourced from the stormwater basin. This demand cannot be met by direct collection of roof water, and consequently use of stormwater from the basin is the next option. This level of reuse is likely to continue or increase slightly with the site expansion. The hammermill is the primary water user and its throughput is unlikely to significantly increase. In line with an increased amount of processing occurring indoors, improved containment of the separator waste, and improved drainage and hardstanding, the amount of dust suppression required is likely to decrease.

## 4.2 *REUSE OF WATER*

Blacktown Development Control Plan (2006) Part R Water Sensitive Urban Design and Integrated Water Cycle Management identifies that:

*'Industrial and commercial developments must supply 80% of their non potable demand using non potable sources. This shall include the use of rainwater as the primary source and be supplemented by recycled water only in instances where rainwater cannot meet 80% of the demand. Where the 80% demand threshold cannot be met, the use of non potable sources shall be maximised and will be considered on a merits basis by Council. Examples of non potable demand includes toilet and urinal flushing, washing machines, garden watering (irrigation), vehicular washing, ornamental ponds and cooling tower top up.'*

This section explains how this requirement is complied with.

### 4.2.1 *Rainwater harvesting*

Rainwater tanks are already present on some of the existing sheds and will remain following the development. Additional rainwater tanks are also proposed, and are shown on *Figure 3* (including a minimum 22,500L tank to be established adjacent to Post Shredder Processing 'Building C'). All rainwater tanks will be covered.

Rainwater tanks would likely be best suited to providing water for refilling the wheel wash and for cleaning and washdown requirements in operational areas where the water from the stormwater basin is of insufficient quality, or rainwater tanks are more convenient. Use of collected rainwater will be made as required, and expansion to the planned collection volume considered if further need is identified.

There may also be options to use harvested rainwater to reduce mains water in other areas, for example uses such as toilet flushing, however costs to install separate supplies to non-potable uses in a building are often significant.

Rainwater will be used to the maximum practicable extent, however the capacity to collect and distribute rainwater directly from rooftops will not approach process requirements (will be much less than 80% of the demand).

The process water requirement will be met by reusing water collected in the stormwater basin, at an estimated average rate of 100m3 per day.

The required rate of 80% of non-potable use to be supplied by rainwater is met via these two sources. The total projected use of mains water (including some non-potable uses such as toilet flushing and cleaning inside buildings) is approximately 3,200L per day. Therefore, at least 95% of site non-potable requirement will be met using rainwater.

### 4.2.2 *Risk assessment for water reuse*

For the proposed rainwater uses, there are considered to be no health or environmental risks resulting from likely rainwater quality.

Reuse of water direct from the stormwater basin is currently occurring, and from a process perspective the water quality is acceptable.

Following the expansion, the installation of primary and secondary treatment upgradient of the stormwater basin will result in improvement in water quality in the basin relative to current conditions. Sell & Parker consider that the hammermill process is cooled more efficiently by the stormwater than it is by mains water. Since reuse of the water involves potential for human exposure and/or emissions to atmosphere during heating, it is appropriate to consider whether risks could be associated with the contaminants that may be present in the water.

Contaminants of potential concern include petroleum hydrocarbons, and metals, particularly lead and cadmium. These contaminants originate from the scrap metal that is processed on site. Contact with petroleum hydrocarbons and metals by the site workforce occurs as part of their work, and is managed under the site's health and safety programme with use of appropriate personal protective equipment and welfare facilities. These will be substantially improved in the expansion. Contact with stormwater during reuse is considered highly unlikely to contribute materially to the workers' exposure via dermal contact or incidental ingestion, because the concentrations dissolved in the water are orders of magnitude less than the quantities of oil and metals in and on the scrap that is processed.

Inhalation exposure is relevant to reuse where the water is heated, which occurs in use as explosion prevention water in the hammermill. Water is emitted as steam, which will be extracted via a vacuum hood and emitted via a new chimney adjacent to Building C. Potential for inhalation of aerosols by the site workforce, and by workers on neighbouring sites will be significantly reduced in the new proposed development, in comparison to the current site.

The oil and metal content of the steam is highly unlikely to be influenced by the concentrations present in the stormwater, since much larger quantities of metals and oil are contained in the scrap metal being shredded by the hammermill. Additional exposure to either workforce or neighbours resulting from the stormwater is therefore considered insignificant. Abatement of the hammermill emissions is provided for elsewhere in the development proposal.

It is concluded that there are no significant risks to health or the environment resulting from reuse of site stormwater in the process.

## 4.3 DRAINAGE DESIGN CALCULATIONS

### 4.3.1 *Runoff Coefficients*

Runoff coefficient is a term that relates catchment runoff as a proportion of rainfall depth for nominated storm events, and is generally expressed as a decimal. Two different runoff coefficients are used in this plan for design of water management structures. These are:

*Volumetric Runoff Coefficient ($C_v$)*

This describes the total volume of runoff as a proportion of total rain depth for a nominated storm event and is commonly used to size sediment basins for Type F/D soils. In this report, $C_v$ is used to estimate volumes under average rainfall intensities (ARI) for return periods up to 1 in 100years. ARI values were sourced from Australian Rainfall and Runoff (Pilgrim 1987).

A volumetric runoff coefficient of 0.9 was used in determining the catchment yield from the sealed site areas and manufacturing shed roofs consistent with guidance provided by Annex F of Landcom (2004). Note that there are no significant unsealed areas on the site.

*Peak Flow runoff coefficient ($C_{10}$)*

Peak flow runoff coefficient ($C_{10}$) – converts rainfall intensity to peak discharge in a nominated 10-year ARI storm event, and is used for the construction stormwater management plan. The $C_{10}$ is used to size water conveyance structures and sediment basins for *Type C* soils. The $C_{10}$ value adopted in this plan equals 0.9. This corresponds to the worst case scenario of a 100% impervious site, generating a 10 year ARI Runoff coefficient as outlined in *Figure 14.13 – Runoff Coefficients* of Australian Rainfall and Runoff (Pilgrim 1987).

### 4.3.2 *Catchment yield calculations*

Catchment volumes were calculated for the proposed separate "clean" and "dirty" catchments, using the total areas shown in *Figure 3*. The total "clean" catchment area is estimated as 16869$m^2$ and the total "dirty" catchment area is estimated at 37659$m^2$.

The volume of runoff likely to be harvested from the "dirty" hardstand areas following redevelopment was calculated on an hourly basis over 1hr, 6hr, 12hr, 24hr, 48hr and 72hr return periods to provide an estimate of the short-term volumes that the stormwater basin might be required to retain.

Harvest volume ($m^3$) = Catchment Size ($m^2$) x Average Rainfall Intensity (mm/hr) x Volumetric Runoff Coefficient x time (hrs) ÷ 1000 (unit conversion factor)

The ARIs used in the calculations were as follows:

| Average Rainfall Intensity ARI mm/hr | 1 Year | 5 years | 10 years | 100 years |
|---|---|---|---|---|
| 24 hrs | 3.39 | 5.78 | 6.6 | 10.2 |
| 72 hrs | 1.53 | 2.74 | 3.19 | 5.16 |

The results for 24hr and 72hr periods are shown in Table 4.1 below.

***Table 4.1 “Dirty” Catchment yields for 24hr and 72hr periods***

| Return period | 1yr | 5yr | 10yr | 100yr |
|---|---|---|---|---|
| Volume (m3) per 24hrs | 2758 | 3579 | 4702 | 5369 |
| Volume (m3) per 72hrs | 5076 | 6662 | 8956 | 10371 |

The worst case 1 in 100 year rain intensity is a 5 minute period, which leads to a dirty catchment yield of 616$m^3$ in 5 minutes. The yield for the 1 hr duration at 1 in 100 year return period is 2261$m^3$.

Catchment yields were also estimated over monthly periods, since the stormwater basin and associated treatment should be capable of coping with periods of prolonged higher than average rainfall. This was carried out using the average and worst case monthly rainfall figures from Quaker’s Hill Treatment Plant between 1948 and 2013, substituting these for the ARI in the above formula. For the ‘dirty’ catchment, average and worst case months were calculated, and for the ‘clean’ catchment average wet and dry conditions were calculated. The purpose of the clean catchment figures is to provide an approximate estimate of the amount of clean water potentially available for reuse.

***Table 4.2 Monthly yield estimates for clean and dirty catchments***

| "Dirty" catchment | m3/month |
|---|---|
| Wettest month average (Feb) | 3838.7 |
| Wettest month worst case (Feb) | 15055.5 |
| | |
| **"Clean" catchment** | |
| Wettest average month (Feb) | 1719.5 |
| Driest average month (Sept) | 577.6 |

### 4.3.3 *Stormwater Basin Capacity and Required Treatment / Discharge Volume*

The current available stormwater basin capacity is approximately 5200m$^3$, following raising of the bund walls. A permanent construction is proposed, providing the maximum practical retention volume that can be provided within the operational constraints of the site. In order to achieve this a rectangular vertical sided concrete lined tank is proposed, excavated to a base level of 37.5m AHD (designed to be above water table). The basin will require a permanent minimum volume of water to accommodate the pumps (required for pumping to tertiary treatment and reuse) of approximately 1000m$^3$, The containment performance required, with consideration of management of 1 in 100 year events, was calculated by considering a reasonable 'worst case' scenario in which the site is not consuming water during a heavy rain event.

Consideration was given to using portions of the site as emergency containment to provide some of the above storage volume, however it proved impractical to accommodate these whilst retaining the necessary use of the land. A single larger retention basin was therefore adopted.

A spreadsheet model of the retention and treatment system was created to assess the required holding capacity for different event durations at a 1 in 100 year return frequency. To account for ability to discharge via a treatment system, hourly volumes were calculated to achieve a water balance that outputs results in terms of volume of water retained in a basin of specified capacity. By varying treatment rate and basin volume, the optimum combination required to prevent overflow at 1 in 100year return frequency can be investigated.

The results of the modelling indicated that the best solution for the treatment system best able to meet the water quality requirements is the tertiary treatment model Hydrosystem 1500 together with a retention basin capacity of 8064m$^3$ (exact volume controlled by available space on site). The model results for this option are presented in *Table 2* of *Annex B*.

The operation of this combination of treatment and detention, together with other features of the proposed drainage system are described in the next section.

The selection of this option results in containment of a 1 in 100 year event at all modelled durations.

# 5 *STORMWATER MANAGEMENT PLAN*

## 5.1 *OBJECTIVES OF THE STORMWATER MANAGEMENT PLAN*

This stormwater management plan is intended to provide a framework for future stormwater management on the expanded site, following redevelopment. It sets out the key management processes and infrastructure improvements that are planned to provide a modern, best practice stormwater management system for the facility. The objectives of the plan are:

- Provide for a system that aims to maintain regulatory compliance under a predictable range of weather and operational conditions;
- Include provision for sustainable re-use of water to the extent practicable;
- Provide for appropriate retention and treatment of contaminated stormwater suitable for controlled release to Breakfast Creek;
- Minimise the amount of water requiring treatment by separation of "clean" and "dirty" catchments with separate routing and discharge;
- Minimise inputs of pollutants to 'dirty' stormwater by improved containment and management of potentially contaminating activities.

## 5.2 *DRAINAGE AND STORMWATER INFRASTRUCTURE*

The concept drainage and stormwater management for the site is shown in F*igure 3* of *Annex A*.

### 5.2.1 *Separate Clean and Dirty Catchments*

The 'clean' water catchments on the proposed site are the roofed areas of the sheds and administration buildings and the carpark locations. The "clean" catchment is shown on Figure 3, together with the drainage routes and discharge locations. Some modifications to existing building roof drainage will be made to result in drainage of all clean areas either north into stormwater drains along Tattersall Road, east to the stormwater channel along the site's eastern boundary, or south into Breakfast Creek via dedicated underground drains. The roof and car park drainage is not considered to require treatment or detention. Roof water will be directed first to rainwater storage tanks, which will then overflow to stormwater drainage once full.

Note that the access road and car park that are part of the clean area are not on the truck route in and out of the site, and only light vehicles and pedestrians will use these areas.

The remainder of the area (other than the "contained" areas) is classed as "dirty" and will drain via dish and grated drains through the treatment and retention system. This includes wheel wash water from the wheel wash.

"Contained areas" are allocated for activities that have potential to generate highly contaminated liquids. These include the oil drainage pad used for draining fuel and oil from incoming vehicles, the proposed new truck wash bay, the hazardous goods store and drum wash, all of which are marked on Figure 3. These facilities will be separately bunded and contained, and drained to self contained tanks. They are all roofed (drainage from these small roofs will be to "dirty" catchment, since separate collection of small isolated buildings is not practical). Contents of the tanks and bunds from the contained areas will be removed off-site for treatment by licensed contractor, or will be discharged to sewer under agreement with Sydney Water if appropriate (eg, truck wash).

### *5.2.2 Drainage infrastructure*

The current and expansion site are primarily hardstanding surface, and this will also be the case with the new development. Clean area drainage is largely already in existence, and minor modifications will be made to provide for separation of the drainage routing from the "dirty" catchment. Site topography and bunding (if required) will be used to provide segregation of the clean catchment and dirty catchment. Because the site slopes consistently and reasonably steeply to the south, overflow from dirty to clean areas under high rainfall conditions is not likely to be possible; if overflow under extreme conditions occurs it will be of clean water to the dirty catchment.

New underground drainage pipes for the clean catchment will be installed along the western boundary to drain roof areas from the buildings in the current site, and from the post shredder processing building (Building C) east to the drainage channel on the eastern boundary. Both drainage pipes are shown on *Figure 3*. The new underground drains will have no gratings such that the only water able to enter is the roof drainage.

Dirty area drainage will be via new dish drains as indicated on *Figure 3*. There will be no grated piped drains across the operational area because these can lead to blockages. Draining the eastern part of the site into the stormwater basin requires a length of drain that is deeper than is acceptable for a dish drain, and this will be a canal-type concrete drain covered by robust trafficable gratings that can be readily removed to clean out the drain. The dirty catchment drains will route by gravity via primary and secondary treatment into the stormwater basin.

Completion of the drainage infrastructure is not proposed until the redevelopment works commences, since access to the current site surface is necessary. Moving some operations into the new site is needed in order to provide space to clean and improve surfaces and install new drains.

Improvements to the site's western boundary containment are proposed, to prevent repetition of the recent (April 20-21 2015) overflow into the neighbouring site to the west. Improvements will comprise reprofiling / bunding of the western edge to channel site run-off back towards the site roadway. This includes compliance with Blacktown Council's requirement for restoring the gap in the bund wall adjacent to Pick & Payless.

### 5.2.3 *Primary and Secondary Treatment*

Primary and secondary treatment units comprise gross pollutant trap and primary and secondary removal of suspended solids and hydrocarbons. The catchments from the existing Sell & Parker site and the expansion site drain separately towards the stormwater basin and each catchment will have primary and secondary treatment installed to treat water prior to its entry into the basin. This will result in a significant improvement to the current position, by reducing sediment and hydrocarbon loading into the basin, improving the water quality available for reuse on site. The locations of the units are shown on *Figure 3*, and the technical specifications are included in *Annex C*.

*Primary Treatment – Ecoceptor*

The Ecoceptor separates and captures sediment, silt, total suspended solids, nutrients, total petroleum hydrocarbons and oil & grease. Floating hydrocarbons are trapped in the oil capture zone of the treatment chamber and are contained in all flow events. Sediments settle in the treatment chamber, and cannot resuspend or scour in high flow events.

The treatment performance of the Ecoceptor is given by the manufacturer as:

- Gross pollutants >3mm 90% removal
- Total Suspended Solids (TSS) >95% of >75µm

  >35% of <75µm

- Total Phosphorus >30% reduction
- Total Nitrogen 30% reduction

The Ecoceptors specified are designed to treat flow to the 90$^{th}$ percentile flow rate (the treatable flow rate, TFR). At flow rates above this, water passes through a bypass and is directed straight into the stormwater basin.

*Secondary Treatment – Stormceptor*

The Stormceptor is a two chamber horizontally installed system, through which flow already treated in the Ecoceptor will pass. Flow enters the primary chamber where sediment is collected and then passes into a secondary chamber (quiescent zone), and finally through a high-reticulated coalescing media trapping and separating fine particulate suspended solids, nutrients and hydrocarbons. Its design prevents resuspension and scouring during high flow events.

Like the Ecoceptor, the Stormceptor also has a bypass system which under high flow conditions will allow water to pass directly into the stormwater basin where it is detained. The stormceptors are also specified to treat the 90$^{th}$ percentile flow.

The Stormceptor performance provided by the manufacturer is:

- TSS >80% reduction for 10-125µm
    - >87% reduction for >125µm
- TPH treatment to <0.1 mg/L, from an inflow concentration of 5000mg/L (highest results obtained from the current stormwater basin = 851mg/L). At a concentration of 0.1mg/L, there would be no visible oil.
- Total Phosphorus >45% removal
- Total Nitrogen 45% removal
- Metals cadmium, chromium, lead, aluminium and zinc >90% removal
- Gross pollutants >90% removal of >5mm

*Compliance with Blacktown Council requirements for stormwater treatment*

The combination of the Ecoceptor and Stormceptor systems provides treatment sufficient for compliance with the Blacktown Council requirements as shown in Table 5.1 below.

***Table 5.1 Treated Stormwater Compliance with Blacktown Council criteria***

| Blacktown Council Requirements | Predicted performance of Ecoceptor + Stormceptor for treated flow | Comment |
|---|---|---|
| Gross pollutants 90% removal | 90% removal of gross pollutants >3mm | Complies |
| Total Suspended Solids removal 85% | >95% for >75µm<br>>87% for <75µm | Complies |

| Blacktown Council Requirements | Predicted performance of Ecoceptor + Stormceptor for treated flow | Comment |
|---|---|---|
| Total Phosphorus removal 65% | >68.5% reduction | Complies. Estimated based on 30% reduction in Ecoceptor, then 45% reduction of the 70% in the Stormceptor (100 – 70*0.45 = 68.5) |
| Total Nitrogen removal 45% | 45% reduction | Complies |
| Total petroleum hydrocarbons 90% removal | 99.9% removal | Complies. Estimate based on reduction of 851mg/L to <0.1mg/L. Actual percentage depends on inflow concentration. |

It is noted that untreated flow during flow rates exceeding the 90th percentile flows into the stormwater basin, and will pass through the tertiary treatment system prior to discharge except on the very rare occasions (exceeding 1 in 100 year event) where extreme events result in a need to overflow the detention system (see *Section 4.3.3*). The combination of the settlement achieved in the stormwater basin and the tertiary treatment will also be adequate to achieve Blacktown Council's water quality requirements.

*Specification for Ecoceptors and Stormceptors*

The specifications for the primary and secondary treatment are shown below in *Table 5.2*. Additional detail and images of the equipment are presented in *Annex C*. The catchment areas are the "dirty" catchment only. Clean catchment areas will not pass through the treatment system and will be directed separately to Breakfast Creek.

***Table 5.2 Specification for Ecoceptors and Stormceptors***

| Catchment | Area | Peak design flow | Treatable flow | Model |
|---|---|---|---|---|
| | m2 | L/s | L/s | |
| Lot 5 DP7086 | 16,750 | 846 | 142.6 | Ecoceptor E 1200/605252 (Series 6000 with 525mm pipe inlet/outlet) |
| | | | | Stormceptor S 400/700 C1.2C.A.525 (Series 400 with 525mm pipe inlet/outlet) |
| | | | | |
| Lot 2 DP550522 | 20,910 | 1054 | 177.9 | Ecoceptor E1200/606060 (Series 6000 with 600mm pipe inlet/outlet) |
| | | | | Stormceptor S. 400/850.C1.2C.A.600 (Series 400 with 600mm pipe inlet/outlet) |

### 5.2.4 *Wheel Wash*

A wheel wash will be provided at the new exit from the expanded site, as shown on *Figure 2*. A Standard Design for a wheel wash (IECA, 2008) is provided in *Annex D*. Proprietary wheel wash facilities are also available and may be considered, particularly given the availability of captured roof water rather than mains supplied water to circulate into the system.

The efficiency of a wheel wash is dependent on the regularity with which it is maintained. Regular removal of captured sediment and regular replacement of wash water will improve the efficiency of the wheel wash. Wash water will be directed through the dirty water catchment system.

### 5.2.5 *Stormwater Basin Improvement*

The existing stormwater basin at the south end of the current site will be cleaned out, deepened to increase the storage volume, concrete lined and connected to the drainage infrastructure downgradient of primary and secondary treatment as indicated on *Figure 3*. The works will include cleaning, reprofiling and resurfacing the area immediately upgradient of the dam, following relocation of operations into the new site. The bund walls will be externally concreted for safe access and prevention of erosion. The new stormwater basin will be a rectangular vertical sided tank, with a boundary fence and access ladder fixed to the tank wall for maintenance access and emergency escape. The stormwater basin volume proposed is approximately $8000m^3$.

Reprofiling of the basin will result in a stable permanent construction with safe access and purpose designed control system. The basin will be used to provide storage of dirty water for reuse in the process, and also to provide retention capacity for extreme storm events (see Water Balance *Section 4* for details). It will also provide the feed for tertiary treatment prior to discharge of treated water into Breakfast Creek. Permanent pumps and piping for removal of water to reuse and treatment will be installed.

### 5.2.6 *Tertiary treatment*

The tertiary treatment will be provided by a SPEL Hydrosystem-1500, with maximum throughput 24L/s (86.4 $m^3/hr$) and optimum flow rate 6 L/s ($21.6m^3/hr$). Pump rate under normal circumstances will be at optimum rate such that the unit's best treatment performance can be realised. Establishment of the actual optimum pumping rate and achievable performance will occur during commissioning, and Sell & Parker intends to run the system during normal circumstances to achieve the best performance the unit can deliver.

Higher rate pumping will occur only when the water level is above the high level trigger, or when pump rate is adjusted manually to respond to weather conditions (ie, to reduce water level as far as possible in the anticipation of an extreme rainfall event). Details of the proposed level control system are provided in *Section 5.2.7.*

The Hydrosystem-1500 has proven performance for relevant pollutants, and is typically used for highly polluted traffic areas. The filter operates using upflow, with water entering at the base where further settlement of suspended solids occurs. The water then passes through a filter element designed to remove metals and dissolved phase hydrocarbons and exits through oil trap providing removal of oil sheen in the event that this occurs in the stormwater basin (which should not occur since removal of visible oil will occur in secondary treatment upgradient of the basin).

In the event that additional removal of trace organics proves necessary (eg, ongoing PFC issue), an additional filter containing a proprietary sorbent "Osorb" can be retrofitted. The Hydrosystem is easily maintained using backwashing to clean the filters, and by periodic cleaning of the silt trap.

Maintenance will be carried out according to the manufacturer's instructions. Typically this would comprise 3 monthly inspections, with minor maintenance annually (eg, filter and silt trap cleaning). Replacement of the filters could be required every 3-5 years. Because the maintenance schedule depends on loading, this will be developed during the first 3-6 months of operation and reviewed as required thereafter.

### *5.2.7 Stormwater Basin Automatic Level Control System*

The available capacity of the basin is sufficient to provide for normal operational storage and control, with provision of additional capacity to hold extreme rainfall events. Catchment yield calculations are provided in Section 4. The tertiary treatment plant pumps will be operated by an automated control system responding to water level in the basin to switch pumps on and off. This section explains the conceptual operation for an automatic level control system. Details of the levels, pump rates, and control mechanism will be developed during detailed design and commissioning.

The basin level control system will provide for two level controls, with high and low level triggers starting and stopping the pumps to the treatment plant. This permits tertiary treatment to operate at optimum efficiency by controlling the throughput to optimum flow. Pumping will commence at the set optimum treatment rate when the high level is reached, then cease when the low level is reached. There will be storage above the high level trigger providing for extreme weather containment; the high control level will only be exceeded if water continues to flow into the basin once the high level is reached.

If pumping at optimum rate fails to draw the water past the high level trigger within a set period of time, the system will change to maximum rate pumping and will continue at maximum rate until the low level trigger is reached. Pumping would cease until the high level trigger was reached again, with the pumps starting at optimum rate and changing to high rate if the level fails to drop as described above.

The automated control system will be fitted with manual override such that it is possible to maintain pumping below the high level trigger if required, to increase storage volume in anticipation of a high intensity rainfall event.

The set levels for the high and low trigger points will be established during detailed design to optimise plant performance, storage capacity and energy efficiency combined with process water requirements.

The maximum level of the stormwater basin is 40.30m AHD. Continued inflow from the site once the basin has reached this level will result in overflow to Breakfast Creek, bypassing the tertiary treatment system (which will continue to operate).

## *5.3 STORMWATER DISCHARGE LIMITS AND MONITORING*

The proposed criteria for stormwater discharge quality to Breakfast Creek are provided in *Table 3.6*. The proposed criteria relate to annual average discharge concentrations. Individual compliance samples shall not exceed 150% of the annual average concentrations. This is proposed on the basis that the proposed criteria are set to represent no non-trivial harm over a long time period (essentially the basis of the ANZECC trigger values). A short-term discharge somewhat above the proposed criteria is unlikely to result in non-trivial harm provided that action to correct the position is taken in a timely way.

Monitoring is proposed at monitoring point MP1 at the outflow from the tertiary treatment plant. The location is shown on Figure 3. Compliance monitoring will be undertaken at a minimum rate of 1 sample for every month that discharge takes place, with results forwarded to NSW EPA annually. The site may elect to obtain additional samples from MP1 as required for management and maintenance of the treatment systems, and these shall be included in the calculation of annual average for compliance assessment. Analysis shall be for the full list of analytes in Table 3.6 on a minimum of 1 sample for every month that discharge takes place. Extra samples may be analysed for a subset of the *Table 3.6* analytes if the site so chooses.

In the event of a non-compliance (single sample >150% annual average value) NSW EPA shall be informed within 24hrs of receipt of analytical data. A repeat sample shall be obtained and analysed, with the result provided to NSW EPA within 24hrs of receipt. If the repeat sample also fails, discharge shall cease and an investigation into the cause of the problem shall commence. NSW EPA shall be provided with an action plan, and discharge shall not recommence until compliant operation of the treatment plant has been re-established.

## 5.4 *MANAGEMENT FOR POLLUTION PREVENTION*

### 5.4.1 *Containment Areas and spill management*

Currently drainage of oil and fuel from incoming scrap vehicles and machinery is carried out in an open site area. In the expanded facility, a new roofed, bunded area will be provided, allowing for improved containment of spills and prevention of wash off of oil into the drainage system. Waste oils and other liquid wastes from the drainage bay will be contained in drums or IBCs and sent off-site for licenced recycling, treatment and/or disposal.

All potentially contaminating materials used or stored on the site (e.g. fuel, oils) should be prevented from entering the groundwater or surface water systems. At present drums of liquids are stored on commercially available bunding pallets in the workshop or within internally bunded shipping containers on the western fenceline. In the expanded site, a new hazardous goods store is available in a roofed, separately bunded facility adjacent to the truck wash (see *Figure 3*). This will be used for storage of raw materials and liquid wastes.

Bulk storage areas for fuels, oils and chemicals will be contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with *AS 1940 1993 The Storage and Handling of Flammable and Combustible Liquids*.

Refuelling is to take place in locations well away from drainage points. Drip trays should always be placed underneath the equipment being refuelled and a spill kit located in close proximity in the event of any spills. Provision of spill kits and training of site personnel in their use will ensure that in the event of any spills appropriate action can be taken rapidly to prevent and minimise impacts to surface waters or groundwater. Wherever possible, activities that have potential for spills will be located in areas that drain in such a way that spills will not migrate off-site; otherwise appropriate safeguards and spill containment facilities will be installed.

### 5.4.2 Waste management

*Floc waste*

The floc from the hammermill comprises non-metal shredded waste such as foam and plastic from car interiors. It is currently stockpiled in a roofed bay next to the hammermill, and is removed for disposal periodically using a loader.

This activity results in spreading of floc outside the bay and the material creates dust / mud on the hardstanding, and can wash into site drainage. It has significant metal content. In the expanded site, the floc will travel by covered overhead conveyor to Building 'C' (see *Figure 2*) where it will be processed to remove some of the metal content before loading into trucks for disposal. This activity will take place within the building, and this will eliminate the risk to stormwater.

*General site wastes*

Additional trade waste receptacles will be provided for the safe and efficient storage of all construction and miscellaneous wastes, as necessary. Recyclable materials shall be separated and recycled where possible. Otherwise, disposable wastes will be removed from site regularly and disposed by approved means.

### 5.4.3 Oxy-cutting pad

Oxy cutting is required to reduce the size of large items. To prevent explosion risk, oxy cutting cannot be undertaken on the concrete surface, and in the current site is carried out in an area with soil covering the underlying concrete. This contributes significantly to the sediment loading in the stormwater, and also makes keeping other site areas free of mud and dust difficult.

In the expanded site, the oxy-cutting area (see *Figure 2*) will be on a coarser suitable surface (eg, sand) contained within bunds or sandbags to prevent wash-off during rainfall. This will reduce both dust and sediment loading, and facilitate a good standard of site housekeeping.

# 6 GROUNDWATER

## 6.1 BACKGROUND

Information provided in this report, in conjunction with information provided by the NSW Office of Water (NOW) has been considered by ERM in evaluating the current hydrogeological conditions at the site.

## 6.2 GROUNDWATER BORE SEARCH

A search of NSW Office of Water (NOW) registered groundwater bore licences identified 11 licensed bore within approximately 1km of the site (refer *Table 6.1* below).

The logs for boreholes drilled to the east of the site reported a shallow water bearing zone of silty clay between 1.5 and 6.5m below ground level (BGL). *Table 6.1* identifies the boreholes that are adjacent to the drainage line that travels parallel to the eastern boundary of the proposed development site (Lot 2 DP 550522) and eventually drains to Breakfast Creek. The boreholes to the northwest of the site did not report any water bearing zones or aquifer geology, though the standing water level for these wells was uniform at seven metres.

*Table 6.1 Licensed Bores within One Kilometre of the site*

| Bore Reference | Distance / Direction from Existing site | Location | Authorised Purposes | Final Drilled Depth (m) | Standing Water Level (m) | Water Bearing Zones (m) | Aquifer Geology |
|---|---|---|---|---|---|---|---|
| GW112589 | Approx. 500m to the NW | N 6263978 E 306101 | Monitoring Bore | 10.86 | 7.0 | - | - |
| GW112588 | Approx. 500m to the NW | N 6263990 E 306122 | Monitoring Bore | 12.44 | 7.0 | - | - |
| GW112587 | Approx. 500m to the NW | N 6263979 E 306140 | Monitoring Bore | 99 | 7.0 | - | - |
| GW104235 | Approx. 160m to the E[1] | N 6263690 E 306709 | Monitoring Bore | 6.2 | 2.6 | 2.6-6.2 | Grey silty clay |
| GW112580 | Approx. 165m to the E[1] | N 6263690 E 306716 | Monitoring Bore | 5.85 | 3.0 | 4.0-4.5 | Clay |
| GW112581 | Approx. 170m to the E[1] | N 6263645 E 306712 | Monitoring Bore | 5.3 | 2.3 | 2.0-2.5 | Loose moist clay |
| GW112578 | Approx. 275m to the E | N 6263678 E 306818 | Monitoring Bore | 5.8 | 2.5 | 1.5-2.5 | Moist, light brown clay |
| GW112579 | Approx. 180m to the E[1] | N 6263553 E 306704 | Monitoring Bore | 5.6 | 2.5 | 4.5-4.8 | Grey/brown clay |
| GW104236 | Approx. 170m to the E[1] | N 6263495 E 306688 | Monitoring Bore | 6.5 | 3.2 | 3.2-6.5 | Medium to brown clay |
| GW104237 | Approx. 210m to the E | N 6263493 E306726 | Monitoring Bore | 7.1 | 3.2 | 3.2-6.5 | Grey silty clay |
| GW102688 | Approx. 370m to the E | N 6263415 E306884 | Monitoring Bore | 5.55 | 2.5 | 2-5 | Clay, Silty/Sandy |

1. These groundwater wells are directly adjacent to the lot of proposed development (Lot 2 DP 550522)

## 6.3 *GROUNDWATER ASSESSMENT*

The proposed development does not require any activities such as significant excavation that would cause direct disturbance to groundwater. Adjacent groundwater wells indicated that the shallowest aquifer would be approximately two metres BGL. The site of the proposed development is already sealed with associated drainage installed such that limited infiltration rainwater occurs on the site. The Natural Resource Atlas indicated that the groundwater identified in wells adjacent to the site is saline. There are not expected to be any significant effects on regional groundwater as a result of the expanded site operations.

The EIS completed by ERM in 1999 reviewed to previous reports addressing contamination at the site:

- ADI Services (1995a), Environmental Site Investigation for 45-47 Tattersall Road, Blacktown, NSW, 3 November 1995; and
- ADI Services (1995b), Stage 2 Environmental Site Investigation, 45-47 Tattersall Road, Blacktown, NSW 8 December 1995.

The site history described in these reports indicated that there were several areas with potential for contamination:

- heavy metal contamination from boiler making activities;
- imported fill used to level the rear of the site;
- pesticides from previous farming activities;
- two underground storage tanks;
- two underground septic tanks;
- contamination from painting activities near the timber mill; and
- oil spillage.

The results of Stage 2 investigation (ADI Services 1995b), showed the following:

- concentrations of PAHs, OCPs, and OPPs in soils tested were below laboratory detection limits and the guideline criteria at the time;
- the validation results obtained during the removal of the underground tanks showed that all concentrations of TPH , BTEX and lead were either below detection limits or applicable guideline criteria at the time;

- there were some locations where concentrations of copper and zinc were above the ANZECC guidelines for unrestricted use. These were in surface soil samples only; and

- asbestos cement sheeting was detected in one sample in the north western corner of the site. This was recommended to be removed.

The area of expanded operations is currently operated by Dexion, a manufacturer of pallet racking, industrial and office storage equipment. Much of this site is comprised of hardstand surfaces and is enclosed with manufacturing sheds and warehouses.

The implications of the proposal in terms of *Principle 4* of the *NSW Groundwater Quality Protection Policy* (DLWC 1997), is discussed below:

- **Threat Factor:** The proposed development is an expansion of the existing metal recycling facility. Fuels and lubricants will be stored in appropriately bunded and roofed locations and refuelling will occur with drip trays and spill mats. The site is connected to the town water and wastewater network. Water for processing will be sourced from mains supplied water and water within the stormwater pond, as is current practice at the site and rain water tanks. The proposed expansion therefore poses limited inherent risk of groundwater quality impacts. No pumping of groundwater is proposed, therefore groundwater levels would not be lowered.

- **Vulnerability of the Groundwater System:** The NSW Natural Resource Atlas (2014) identifies that the vulnerability of the groundwater is low. There is no known groundwater use for drinking water supplies downstream of the site. The only potential for impact on the groundwater is from the potential contamination remaining in the soil/groundwater from previous activities occurring on the site when the concrete seal was not installed.

- **Beneficial Use of the Groundwater:** The beneficial use classification depends upon the quality of water present and the potential long-term value of the resource. The existing site currently drains to a lined stormwater basin that is prohibited to discharge. The proposed expansion site drains to an improved, larger stormwater basin that will be equipped with primary, secondary and tertiary treatment prior to discharge to Breakfast Creek. Downstream of the sites is the heavily disturbed Breakfast Creek. Breakfast Creek is currently being improved by Blacktown Council, involving realignment and lining with rock, with additional vegetation planting proposed within the riparian zone.

Operational water supply for the site will be provided by:

- reuse of water from the stormwater basin;
- rain water captured from the roofs of the manufacturing sheds; and
- mains supplied town water when the above sources are insufficient

No groundwater will be extracted for the operation. The proposed expansion is unlikely to further impact groundwater supplies and consequently will not alter the current beneficial use of groundwater.

### 6.4 GROUNDWATER MONITORING

As the site will not be excavating material or extracting groundwater, it is not expected that the proposed site expansion will further impact the regional groundwater quality or quantity. As such it is not proposed to undertake a groundwater monitoring program on the site as a result of the proposed expansion.

# 7 CONCEPTUAL CONSTRUCTION PHASE SOIL AND STORMWATER MANAGEMENT PLAN

## 7.1 INTRODUCTION

Proper planning for soil and water management is essential to ensuring that land disturbance associated with construction and the on-going operation of the site does not lead to significant detrimental impacts on the surrounding environment.

Landcom (2004) describes six general principles of effective soil and water management for land disturbance which are relevant to the site activities. The principles can be paraphrased as:

- assess the soil and water implications of a project at the planning stage;
- plan for erosion and sediment control and assess site constraints during the design phase and before any earthworks begin;
- minimise the area of soil disturbed and exposed to erosion;
- control water flows from the top of and through disturbed areas – divert up-slope 'clean' water away from disturbed areas and ensure concentrated flows are below erosive levels;
- rehabilitate disturbed lands quickly; and
- maintain erosion and control measures for the duration of the project and until the site is successfully rehabilitated.

In addition, programs should prioritise erosion control which is the most effective means of limiting adverse environmental impacts. Specific erosion controls should be targeted at 'high risk' areas, such as drainage lines that receive concentrated flows, steep or long slopes containing erodible materials, or areas that are not well protected by downstream pollution controls. Generally it is possible to stage the development in a way that reduces the erosion hazard.

## 7.2 EROSION HAZARD ASSESSMENT

The overall erosion hazard has been assessed as very low within the site considering the following assumptions that will, based on conservative estimates, limit the soil loss to less than 150 cubic metres $m^3$/hectare/year:

- works will be staged to limit the extent of exposed soil at any one time;

- clean and dirty catchment areas will be separated with bunds/sandbags during earthworks;

- the runoff generated from the earthworks on the Dexion site (Lot 2 DP 550522) will be managed within this lot only, with no runoff to enter the Sell and Parker (Lot 5 DP 7086) site;

- The sediment basin will remain in its current form throughout the earthworks activities to be undertaken on the current Sell and Parker (Lot 5 DP 7086) site, providing a final treatment location for sediment laden water generated;

- the majority of exposed surfaces on the site will be relatively flat (less than 3%) will ultimately be hard sealed with concrete.

- the demolition activities on both sites are not considered likely to significantly add to the potential for erosion and sediment generation on the site.

### 7.3 *SUMMARY OF SITE CONSTRAINTS AND CHARACTERISTICS*

*Table 7.1* summarises the key site characteristics that help to assess the erosion hazard and design management works. Comparison of the slope percentage and the R-factor with Figure 4.6 – Assessment of Potential Erosion Hazard from Landcom (2004), shown in *Figure 7.1* below demonstrates that the site has a low erosion hazard.

***Table 7.1 Site Constraints and Characteristics***

| Constraint / Characteristic | Description / Value |
|---|---|
| Rainfall | R-factor = 2500 |
| Rainfall zone | Zone 4 (Conservative estimate based on Figure 4.9 in Landcom, 2004) |
| Slope gradients | Site is generally flat with a slight fall towards the south <5%. |
| Soil erodibility | K-factor = 0.038, typical value for the Blacktown Soil Landscape present at the site. Where the concrete will be disturbed to expose soils below this K-factor can be assumed. |
| Conservative estimate of soil loss[1] | Well under 150 tonnes/ha/year |
| Soil loss class | 1 – very low (refer Table 4.2 in Landcom, 2004) |
| Soil texture group | Assumed to be Type D – dispersive based on Blacktown Soil Landscape. |
| Soil hydrologic group | Group C – moderate to high runoff potential (refer Annex F in Landcom, 2004) |

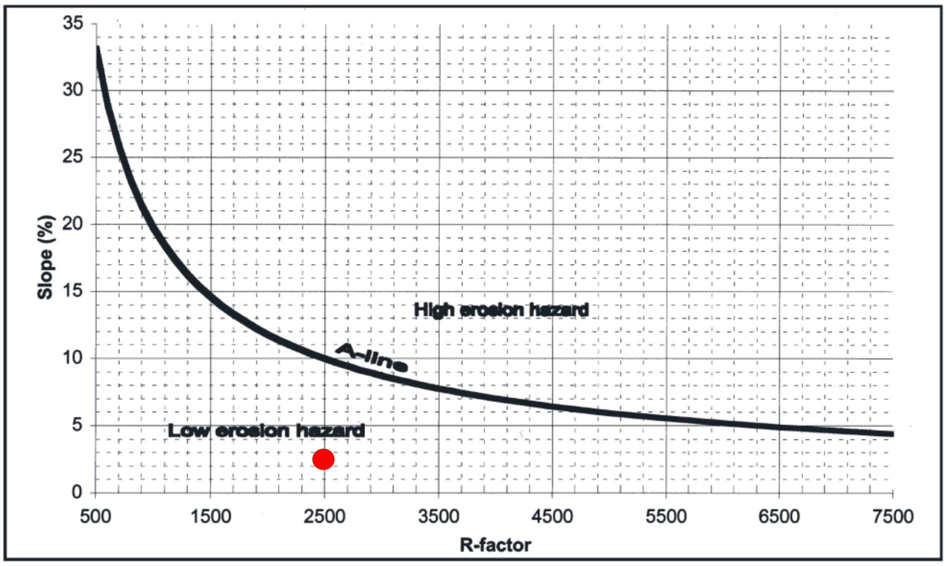


*Figure 7.1 Assessment of potential erosion hazard (From Landcom, 2004)*

## 7.4 EROSION CONTROL

Erosion control measures to be implemented during construction activities are as follows:

- limit disturbance to two metres beyond the edge of any essential construction activity;
- plan construction works to limit the amount of disturbed area at any one time;
- provide a single stabilised site access point to each key construction area that is defined using sediment fence (downslope) and barrier fence/bund (upslope);
- coordinate work schedules, if more than one contractor is working on a site, so that there are no delays in construction activities which would cause disturbed land to remain unstabilised for longer than 2 weeks;
- progressively install stabilisation measures; such as sealing of access ways, to minimise exposed areas; and
- during windy weather unsealed areas will be kept moist (not wet) by sprinkling with water to reduce wind erosion as required.

Stabilisation is the key erosion control method throughout the operation of the site (primary through the implementation of the concrete sealing) and should be undertaken progressively throughout the construction process

## 7.5 *SEDIMENT CONTROL*

### 7.5.1 *Inlet Protection*

Inlet protection is proposed to minimise the potential for sediment entrained runoff from entering the existing and proposed drainage network. The location of these protection measures is provided in the Sediment Control Plan (Algorry Zappia drawing D03 B) provided in *Annex A*. Standard Drawing 6-12 of *Annex D* displays the design characteristics.

### 7.5.2 *Site Access Points*

At present the ingress and egress to the sites are hard sealed so in the event that no disturbance is required to refurbish the tracked areas of the site, should prove useful to mitigate against mudtracking from the site. Should vehicles be required to track through exposed soils during the redevelopment, the use of a temporary construction access of rock is recommended.

A truck wheel wash is to be constructed on the proposed egress to Lot 2 DP550522. Construction of this wheel wash will be the primary measure of controlling mudtracking during operation, and if staged appropriately during construction will prevent mudtracking during the refurbishment. Alternatively the existing truck wash on Lot 2 DP 550522 that is proposed to remain can be utilised to clean construction vehicles as required, to prevent mud-tracking on public roadways. See *Annex D*, Standard Drawing 6-14 Stabilised Access.

### 7.5.3 *Sediment Trap*

The main sediment trap to be utilised as a perimeter control is a sediment fence. The sediment fence is proposed for installation along the entire eastern and southern perimeters and the south western perimeter. Returns in the sediment fence should be installed every 20m to prevent loading at a single low point of the sediment fence. Standard Drawing 6-8 in *Annex D* provides details on the erection of the fencing.

Excavated sediment traps or sumps can be utilised throughout the earthworks process to effectively provide treatment at the source of the sediment generation. Treatment is achieved through gravity induced settlement of the entrained sediment. Sumps require dewatering after storm events to restore capacity and need regular desilting to reduce the potential for re-suspension of sediment in subsequent storms.

## 7.6 *KEY CONSTRUCTION PHASE EARTHWORKS ACTIVITIES*

### 7.6.1 *Installation of Services (Trenching)*

The following erosion and sediment controls apply to trenching activities:

- schedule works for outside of forecast inclement weather and limit the disturbance to the shortest timeframe possible;
- divert upslope runoff leading to the trench;
- use common trenching for the various service and drainage connections;
- protect any nearby (downslope) drainage inlets with inlet protection, sandbags or sediment barriers until the trench line is stabilised;
- in the few locations on-site where this is applicable, remove and store vegetated topsoil (sod) so that it can be replaced on the trench to provide immediate erosion protection after backfilling is completed. Store topsoil separately from any subsoil overburden so that when the trench is to be refilled, the topsoil can be replaced above the subsoil;
- ensure trench widths are the minimum needed to safely install the services;
- organise service installations to enable progressive backfilling;
- when trenching parallel to site contours (across grade), soil from the excavation should be placed and compacted on the uphill side of the trench to form an earth bank. This is to prevent stormwater entering the trench by directing stormwater around and away from the open trench. This measure may be avoided where trenches are expected to be open for less than 24 hours and where the likelihood of rain is low;
- when trenching perpendicular or obliquely to site contours (down grade):
  - use sandbags as plugs or bulkheads across trench inverts to shorten the length of stormwater flow in the trench (so reducing erosion of soils in the trench);
  - ensure plugs, collars or trench stops are employed to control tunnel erosion after backfilling is completed;
  - provide cross banks at regular intervals to prevent concentrated water flows along the finished (backfilled) trenchline (where concreting over the backfilled trench will not be undertaken);

- backfill subsoil and compact to 95 per cent Standard Proctor. Replace topsoil and any sod to match surrounding ground levels. Provide an appropriate allowance for settling of uncompacted backfill material (e.g. 10%);
- after backfilling, remove excess or unsuitable spoil from the site; and
- stabilise the site, in the majority of cases by sealing with concrete, as soon as possible.

*Dewatering of the Project Site*

Areas of the project site may require dewatering during the lifetime of the construction activities. This may apply to low lying depressions becoming inundated following a significant storm event; to dewatering of open trenches following rainfall; or dewatering of open excavations to allow for service installation (trenching). This water has the potential to be contaminated with suspended sediment and therefore will be managed so that disposal does not contribute to water pollution.

When pumping dirty water out of construction areas the pump intake will be kept as close to the surface of pools as possible to avoid sucking sediments off the bottom.

Water should be used on site for dust suppression or may be discharged into the stormwater pond to allow for captured solids to settle. The tertiary treatment systems is proposed to be built first and as such will allow for water to be treated and discharged upon meeting water quality requirements, to restore capacity to the basin.

### *7.6.2 Amelioration Works on the Existing Stormwater Basin*

The existing sediment basin is to be dredged, cleaned, excavated to increase volume, reprofiled, relined and the banks stabilised and concreted for safe access. The adjacent area (hand unloading area) is to be cleaned, concrete broken out, reprofiled and resurfaced.

It is envisaged that this work will be scheduled after the site earthworks are completed, except to the extent that suitable fill from the basin excavation is required for filling in other areas of the site.

Prior to undertaking the amelioration works, the basin will need to be dewatered. Dewatering will also be achieved by treating through the tertiary treatment system. However should it be required, liquid removed from the basin is to be collected by a suitably licenced liquid waste contractor and appropriately disposed.

Similarly surplus material excavated from the basin should be appropriately disposed of to a licenced facility, following classification of the material in accordance with the Waste Classification guidelines. It is recommended that material excavated from the basin is immediately loaded onto trucks to be transported to the disposal facility to eliminate the requirement to store the material in stockpiles on the site.

#### *7.6.3 Excavations for stormwater treatment plant*

The following mitigation measures are proposed for the installation of the stormwater treatment plant (primary and secondary treatment):

- schedule the excavation works for periods outside of forecast inclement weather;
- install sediment fence downslope of the disturbed area and the proposed stockpile location;
- all runoff generated upslope of the excavation will be diverted around the excavation during construction;
- dewater any collected runoff in accordance with *Section 7.6.1*; and
- stabilise the locality as soon as is practicable.

#### *7.6.4 Earthworks on the Dexion Site (Lot 2 DP 550522)*

Exposure of earth on Lot 2 DP 550522 is proposed to be managed wholly within this lot. Runoff generated from this location is not to be directed towards Lot 5 DP 7086 or the existing basin on the existing Sell and Parker site, thus eliminating the potential for runoff to interact with stockpiled metals and potentially become contaminated to a greater extent than the entrained sediment.

The very low erosion hazard of the site is well under the requirement to implement a sediment basin (at $150m^3$/ha/yr) on the site and thus any runoff from this lot can be sufficiently treated through the sediment controls outlined in *Section7.5*.

All earthworks and drainage infrastructure is to be complete prior to the relocation of stockpiled scrap metals from the existing Sell and Parker site. From the commencement of stockpiling on the outdoor areas of the Dexion site the temporary erosion and sediment controls will no longer be sufficient manage water quality given the potential for contaminants in addition to sediment, hence the proposed drainage network and tertiary treatment system are to be functional to allow for the effective treatment of the runoff generated from the relocated operations.

### 7.6.5 *Earthworks on existing Sell and Parker site (Lot 5 DP 7086)*

Management of site runoff generated during the earthworks on the current Sell and Parker site (Lot 5 DP 7086) is proposed to be directed to the existing basin and the tertiary treatment system. The only exception to this proposed form of management will be the excavation of the current exit ramp and the widening of the ingress ramp which will be more appropriately managed by a sump sediment control that can be constructed within or directly adjacent to the earthworks areas. This will prevent the deposition of sediment in uncontrolled down gradient locations within the site.

It is proposed that the tertiary treatment system be installed and operational prior to any earthworks commencing on the existing Sell and Parker lot. The operation of the treatment system will allow for runoff within the basin to be treated and released off-site upon meeting designated water quality requirements. The basin was originally designed to meet the runoff generated by the catchment within this lot. As no additional catchment area is proposed to reach the basin during the construction phase (given that the Dexion site will be managed such that no runoff enters the current Sell and Parker site) the basin will still be sufficiently sized to hold the runoff generated from the catchment. The volume of water within the pond will need to be maintained to ensure that sufficient capacity is available to hold runoff in design storm events. The earthworks on Lot 5 DP7086 will be staged, acting as an effective erosion control by limiting the extent of exposed earth at any one stage.

### 7.6.6 *Stockpile Management*

Excavated material will need to be stockpiled on-site and hence appropriately managed to prevent downstream sedimentation. Stockpile management is a simple 'at source' control that can significantly limit the generation of sediment entrained runoff. The stockpiles will be located outside of concentrated flow areas such as drains and away from stormwater inlet pits within the site. Upgradient diversion of runoff using sandbags is to be implemented to prevent upslope runoff encountering the stockpile. Given the low volume of material to be excavated erosion control in the form of covering the stockpiles (with black construction plastic for example) may be suitable, in the event of forecast inclement weather. Any excess stockpiled material to be removed from the site is to be sampled and analysed in accordance with the Waste Classification Guidelines and upon receipt of the analysis results, disposed of at an appropriately licenced facility. See *Annex D*, Standard Drawing 4-01 Stockpiles.

## 7.7 *CONSTRUCTION SITE MONITORING AND MAINTENANCE*

Essential to an effective system of erosion and sediment control, is an adequate inspection, maintenance and cleaning program. Inspections, particularly during storms, will show whether devices are operating effectively. Where a device proves inadequate, it should be quickly redesigned to make it effective.

It is recommended that a delegated site representative undertake regular inspections of the erosion and sediment controls and to advise on necessary changes, to help ensure the success of the erosion and sediment control program. Inspections should be undertaken at least monthly, and always after significant rainfall events until final stabilisation of the site.

*REFERENCES*

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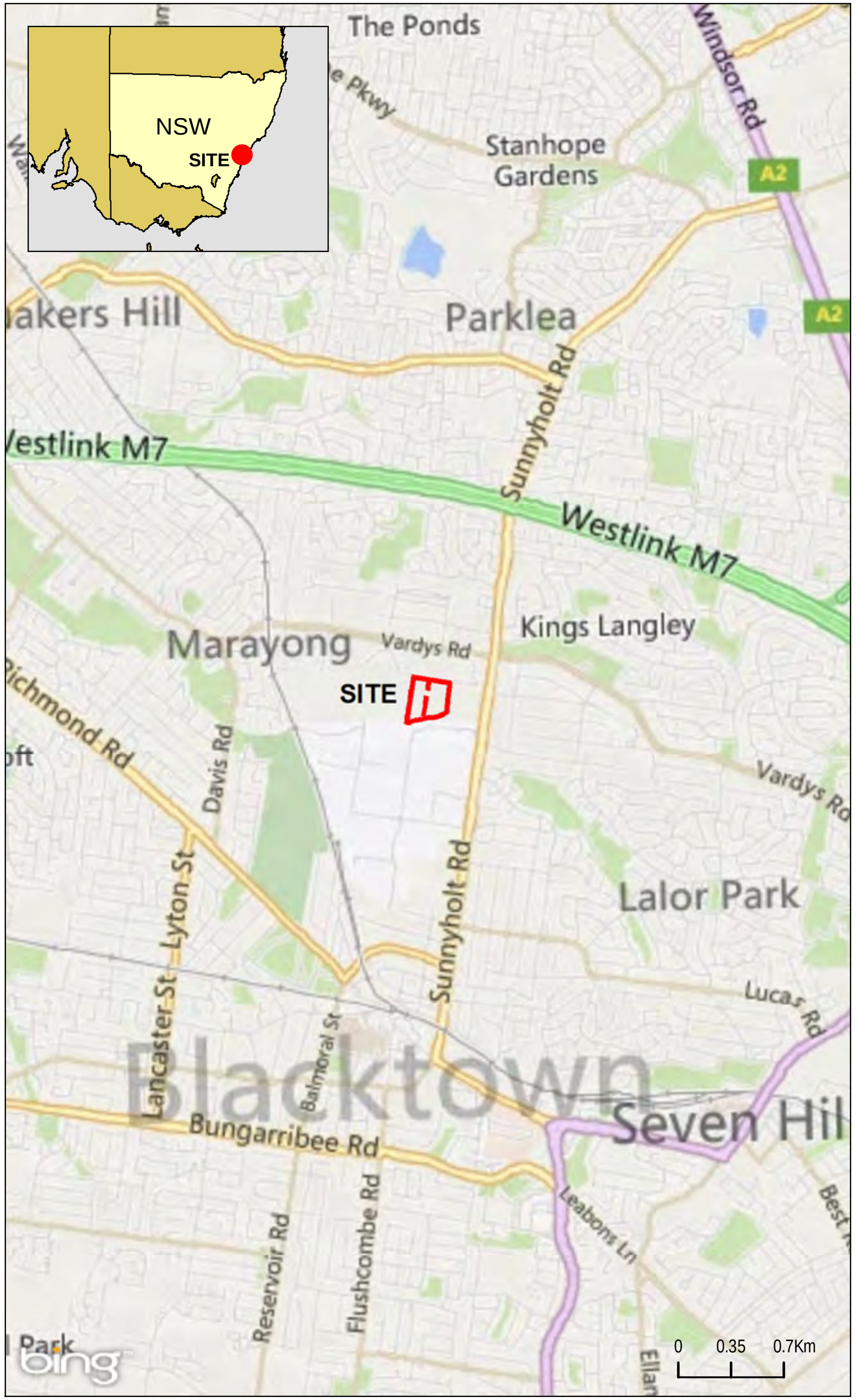
Annex A

# Figures





Legend

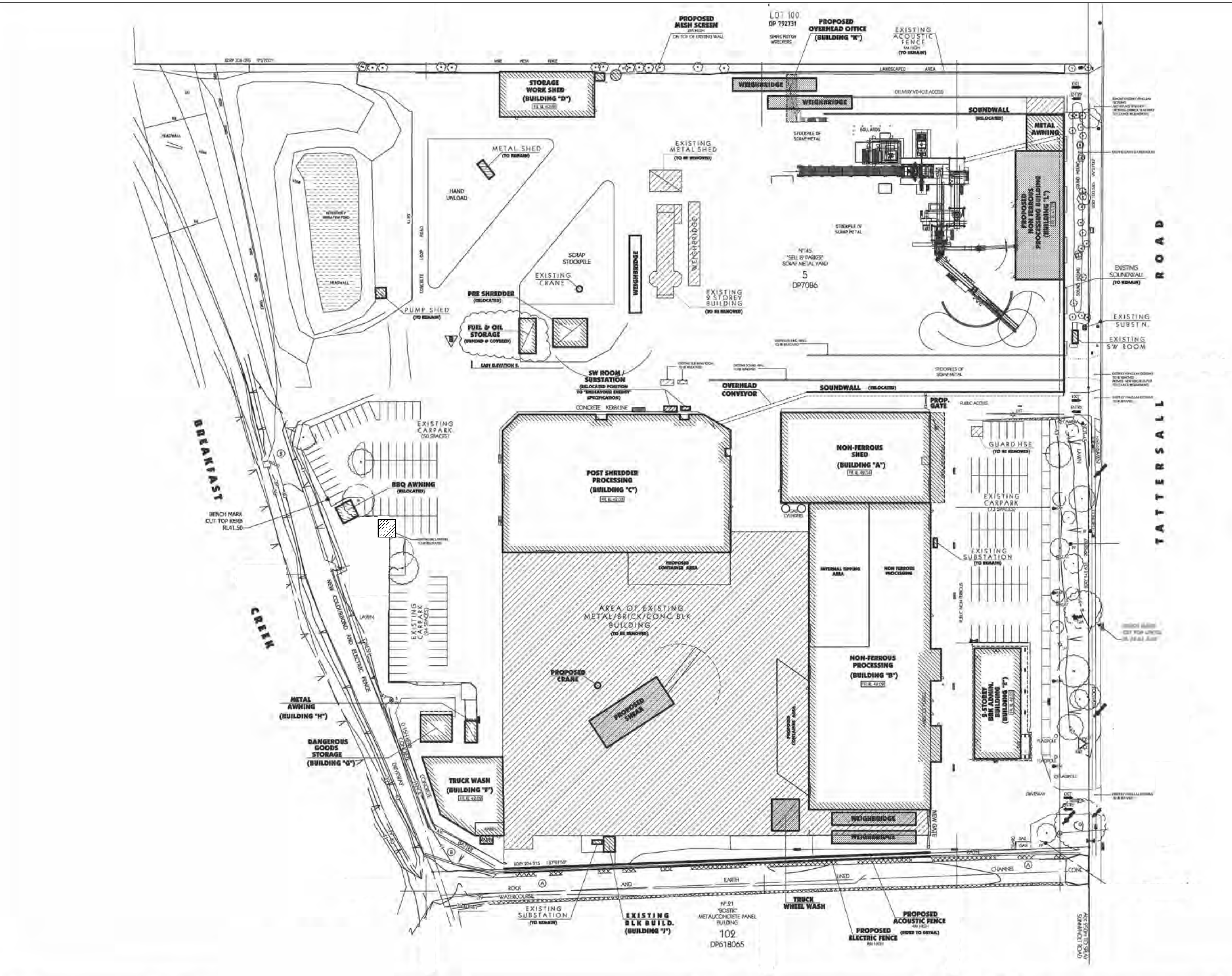
Site Boundary

Source:
nearmap imagery date
5 May 2015

N

| | | | |
|---|---|---|---|
| Client: | Sell & Parker | | **Figure 1 - Site Location** |
| Drawing No: | 0226308s_SMP_G002_R0.mxd | | Sell & Parker SMP |
| Date: | 26/05/2015 | Drawing Size: A4 | 45 Tattersalls Road, Kings Park, NSW |
| Drawn By: | GC | Reviewed By: SW | |
| This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy. | | | Environmental Resources Management ANZ<br>Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney |

ERM




Legend

- Existing Structure to Remain
- Existing Structure to be Removed
- Proposed New Structure
- Existing Structure to Reuse or to be Relocated

Source:
Algorry Zappia & Associates Pty Ltd, P4144, 18/05/15.

Drawing Not to Scale

N

| | | | |
|---|---|---|---|
| Client: | Sell & Parker | | |
| Drawing No: | 0226308s_SMP_C001_R0.cdr | | |
| Date: | 22/05/2015 | Drawing size: A3 | |
| Drawn by: | GC | Reviewed by: SW | |

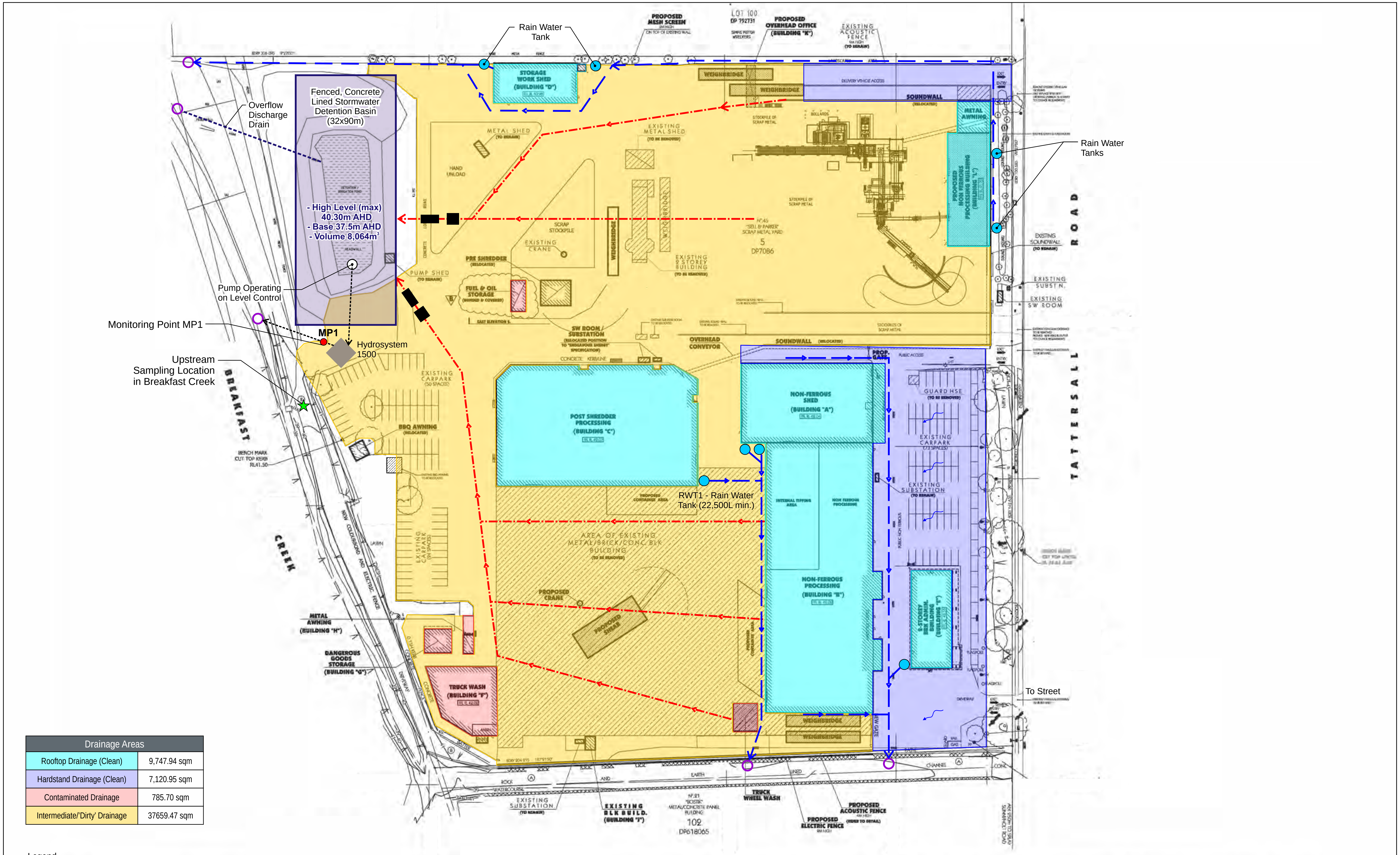
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

**Figure 2 - Proposed Site Layout**

Sell & Parker SMP
45 Tattersalls Road, Kings Park, NSW

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney




| Drainage Areas | |
|---|---|
| Rooftop Drainage (Clean) | 9,747.94 sqm |
| Hardstand Drainage (Clean) | 7,120.95 sqm |
| Contaminated Drainage | 785.70 sqm |
| Intermediate/'Dirty' Drainage | 37659.47 sqm |

Legend

- Existing Structure to Remain
- Existing Structure to be Removed
- Proposed New Structure
- Existing Structure to Reuse or to be Relocated
- Rooftop Drainage (Clean)
- Hardstand Drainage (Clean)
- Contaminated Drainage (Pump Out/Trade Waste)
- Intermediate/'Dirty' Drainage
- Discharge Locations
- Rain Water Tank
- Ecoceptor (Primary Treatment)
- Stormceptor (Secondary Treatment)
- Hydrosystem - 1500 (Tertiary Treatment)
- 'Dirty' Drainage (Dish Drain)
- Clean Drainage (Underground - No Grates)

Source:
Algorry Zappia & Associates Pty Ltd, P4144, 18/05/15.

Drawing Not to Scale N

| | |
|---|---|
| Client: | Sell & Parker |
| Drawing No: | 0226308s_SMP_C002_R0.cdr |
| Date: | 22/05/2015 Drawing size: A3 |
| Drawn by: | GC Reviewed by: SW |

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

**Figure 3 - Concept Drainage Plan**

Sell & Parker SMP
45 Tattersalls Road, Kings Park, NSW

Environmental Resources Management ANZ

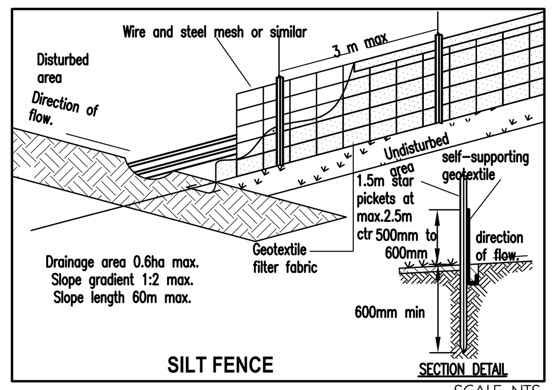
Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

## SOIL CONSERVATION NOTES

A.1) PRIOR TO ANY CLEARING OR EXCAVATION AT THE PROJECT SITE. A TEMPORARY SEDIMENT TRAP ARRANGEMENT SHALL BE MADE TO ENSURE THE CAPTURE OF ANY WATER BORNE MATERIAL GENERATED FROM THE SITE.
2) PROVIDE SEDIMENT FENCE AS SHOWN ON PLAN.
3) PROVIDE TEMPORARY CONSTRUCTION EXIT PAD TO PREVENT TRANSMISSION OF SOIL FROM TRUCK TYRES TO PUBLIC ROADS AND DRAINAGE
4) STRIP AND STOCKPILE TOP SOIL (FOR FUTURE RESPREADING) IMMEDIATELY BEFORE STARTING BULK EARTHWORKS. BEFORE STRIPPING,CLEAR THE SITE OF DEBRIS, SLASH OR GRAZE THE SITE WHERE VEGETATIVE GROWTH IS DENSE
5) WHERE POSSIBLE DO NOT EXTEND LAND DISTURBANCE ACTIVITIES BEYOND 5.0M PREFERABLY 2.0M FROM THE EDGE OF ANY ESSENTIAL CONSTRUCTION ACTIVITY.
6) A VEHICLE WHEEL WASH, CATTLE GRID, WHEEL SHAKER OR OTHER APPROPRIATE DEVICE, SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF ANY SITE WORKS OR ACTIVITIES, TO PREVENT MUD AND DIRT LEAVING THE SITE AND BEING DEPOSITED ON THE STREET.

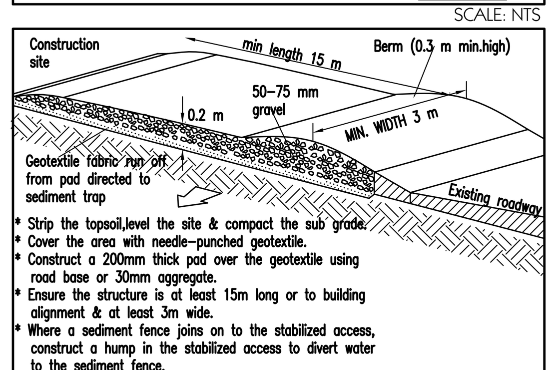
B. DURING CONSTRUCTION

1) SILTATION PROTECTION DESCRIBED ABOVE SHALL BE MAINTAINED DURING THE COURSE OF CONSTRUCTION.
2) NEWLY CONSTRUCTED PITS SHALL BE PROTECTED FROM ANY SEDIMENT ENTRY.
3) ONCE IN PLACE, NO SILTATION PROTECTION SHALL BE REMOVED WITHOUT COUNCIL APPROVAL.
4) AFTER EACH STORM, ALL SEDIMENT TRAPS SHALL BE CLEANED AND REPLACED(IF REQUIRED) TO COUNCIL'S SATISFACTION.
5) VEGETATION AND/OR EXISTING BUILDING STRUCTURES WILL BE CLEARED FROM THE CONSTRUCTION SITE ONLY OTHER AREAS TO REMAIN UNDISTURBED.
6) BUILDING OPERATIONS SUCH AS BRICK CUTTING, WASHING TOOLS OR BRUSHES & MIXING MORTAR ARE NOT PERMITTED ON PUBLIC ROADWAYS OR FOOT WAYS OR IN ANY OTHER LOCATIONS WHICH COULD LEAD TO THE DISCHARGE OF MATERIALS INTO THE STORMWATER DRAINAGE SYSTEM.
7) STOCKPILES OF TOPSOIL, SAND, AGGREGATE, SOIL OR OTHER MATERIAL SHALL NOT BE LOCATED ON ANY DRAINAGE LINE OR EASEMENT, NATURAL WATERCOURSE, FOOTPATH OR ROADWAY & SHALL BE PROTECTED WITH ADEQUATE SEDIMENT CONTROLS.
8) INSTALLATION OF GUTTERS, DOWN PIPES, AND THE CONNECTION OF DOWN PIPES TO THE STORMWATER DISPOSAL SYSTEM PRIOR TO THE FIXING OF THE ROOF CLADDING.
9) OTHER METHODS OF SEDIMENT CONTROL AS MAY BE REQ'D BY THE COUNCIL SHALL BE COMPLIED WITH.

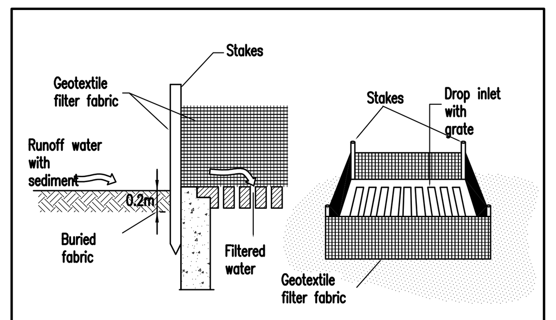



SILT FENCE

SCALE: NTS

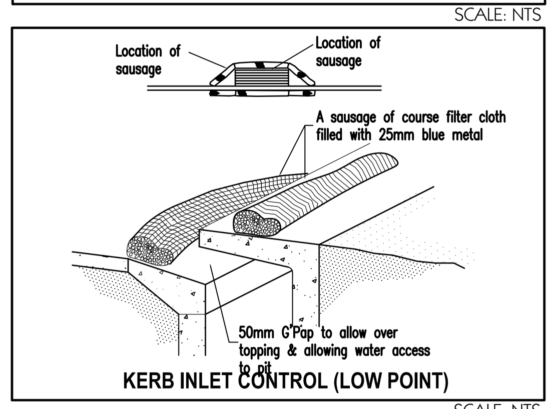



TEMPORARY CONSTRUCTION EXIT



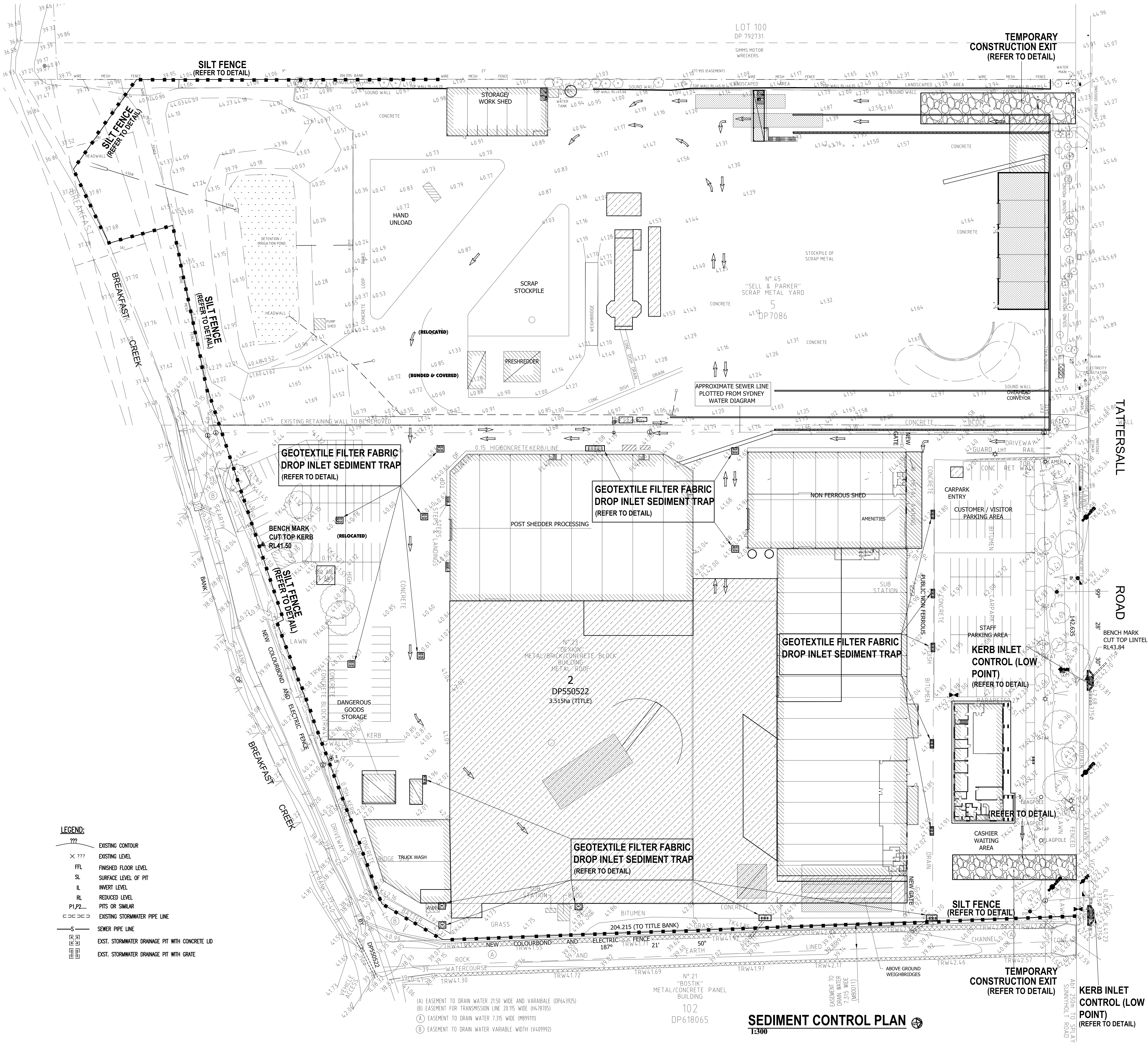

GEOTEXTILE FILTER FABRIC DROP INLET SEDIMENT TRAP

SCALE: NTS




KERB INLET CONTROL (LOW POINT)

SCALE: NTS




**SEDIMENT CONTROL PLAN**
1:300

| Issue | By | Description | Date |
|---|---|---|---|
| A | LA | FOR DA | 06.03.14 |
| B | LA | AMENDED & RE-ISSSUED FOR DA | 29.05.15 |

| | |
|---|---|
| Date | MAR 2014 |
| Scale | AS SHOWN |
| Drawn | LS |
| Checked | LA |
| Certified | |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Project: PORPOSED ALTERATIONS TO EXISTING RECYCLING CENTRE LOT 2 DP550522 & LOT 5 DP7086 , No 23 & 45 TATTERSALL RD, KINGS PARK

Client: SELL & PARKER METAL

Project No.: P4144

Title: SEDIMENT CONTROL PLAN AND SECTION DETAILS

| Activity Type: | Job No.: | Sheet No.: | Issue |
|---|---|---|---|
| DA | 1049-13 | D03 | B |

B1 SHEET

Annex B

# Tables

| Field ID | Sampled_Date-Time | Area | Inorganics: Alkalinity (Hydroxide) as CaCO3 | Alkalinity (total) as CaCO3 | Electrical Conductivity @ 25°C | Carbonate_CaCO3 (Filtered) | Silicon (Filtered) | Sulphur as S | Sulphur as S (Filtered) | Suspended Solids (SS) | TDS | TSS | MNA: BOD | COD | Sulphur (Total Oxidised as SO4) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | mg/L | mg/L | µS/cm | mg/L | µg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | µg/L |
| EQL | | | 1 | 1 | 1 | 1 | 50 | 1 | 1 | 5 | 10 | 5 | 2 | 5 | 1000 |
| ANZECC 2000 FW 95% (metals ** are hardness adjusted using mean hardness value of 142mg/L CaCO3) | | | | | | | | | | | | | | | |
| S1 | 18/11/2013 | Retention Pond | <1 | 160 | - | - | 5860 | 26 | 23 | - | - | 1040 | 59 | 481 | - |
| DAM SPRAY | 14/04/2014 | Retention Pond | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pond 2 | 1/09/2014 | Retention Pond | - | - | - | - | - | - | - | - | - | 64 | - | - | - |
| POND_1 | 1/09/2014 | Retention Pond | - | - | - | - | - | - | - | - | - | 102 | - | - | - |
| HOLDING POND | 12/12/2014 | Retention Pond | <1 | 161 | 779 | - | 6630 | - | - | 32 | - | 32 | 10 | 101 | 129,000 |
| POND_1 | 22/04/2015 | Retention Pond | - | - | - | 223 | - | - | - | - | 410 | 19 | 7 | 70 | 148,000 |
| STREAM 3 | 1/09/2014 | Up Stream | - | - | - | - | - | - | - | - | - | 10 | - | - | - |
| BREAKFAST CK | 12/12/2014 | Up Stream | <1 | 118 | 534 | - | 7550 | - | - | 159 | - | 159 | <2 | 104 | 36,000 |
| STREAM 3 | 22/04/2015 | Up Stream | - | - | - | 89 | - | - | - | - | 242 | 30 | 3 | 16 | 32,000 |

| Field ID | Sampled_Date-Time | PFOS and PFOA: 6:2 Fluorotelomer Sulfonate (6:2 FtS) | 8:2 Fluorotelomer sulfonate | Perfluorooctanoate | PFOS | Field: pH (Lab) | Dissolved Oxygen | Redox | Organic: Oil and Grease |
|---|---|---|---|---|---|---|---|---|---|
| | | µg/L | µg/L | µg/L | µg/L | pH units | mg/L | mV | mg/L |
| EQL | | 0.01 | 0.01 | 0.002 | 0.002 | 0.01 | 0.1 | 0.1 | 5 |
| ANZECC 2000 FW 95% | | | | | | | | | |
| S1 | 18/11/2013 | - | - | - | - | - | - | - | 4700 |
| DAM SPRAY | 14/04/2014 | - | - | - | - | - | - | - | - |
| Pond 2 | 1/09/2014 | - | - | - | - | - | - | - | - |
| POND_1 | 1/09/2014 | - | - | - | - | - | - | - | - |
| HOLDING POND | 12/12/2014 | 0.68 | <0.1 | 0.486 | 10.4 | 7.76 | 7.2 | 195 | 8 |
| POND_1 | 22/04/2015 | 0.34 | 0.02 | 0.266 | 5 | - | - | - | 6 |
| STREAM 3 | 1/09/2014 | - | - | - | - | - | - | - | - |
| BREAKFAST CK | 12/12/2014 | <0.01 | <0.01 | 0.034 | 0.046 | 7.88 | 7.6 | 185 | 5 |
| STREAM 3 | 22/04/2015 | <0.01 | <0.01 | 0.03 | 0.044 | - | - | - | <5 |

| Field ID | Sampled_Date-Time | TRH NEPM (1999): TRH C6-C9 Fraction | TRH >C10-C14 Fraction | TRH >C15-C28 Fraction | TRH >C29-C36 Fraction | TRH >C10-C36 Fraction | TRH NEPM (2013): TRH C6-C10 Fraction | TRH C6-C10 less BTEX | TRH >C10-C16 Fraction | TRH >C10-C16 Fraction less N | TRH >C16-C34 Fraction | TRH >C34-C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L |
| EQL | | 20 | 50 | 100 | 50 | 50 | 20 | 20 | 100 | 100 | 100 | 100 |
| ANZECC 2000 FW 95% | | | | | | | | | | | | |
| S1 | 18/11/2013 | 50 | 12,600 | 638,000 | 200,000 | 851,000 | 70 | 60 | 48,100 | 48,100 | 698,000 | 130,000 |
| DAM SPRAY | 14/04/2014 | <20 | 220 | 3440 | 440 | 4100 | <20 | <20 | 480 | 480 | 3510 | 160 |
| Pond 2 | 1/09/2014 | 40 | 310 | 1500 | 290 | 2100 | 40 | 30 | 540 | 540 | 1410 | 220 |
| POND_1 | 1/09/2014 | 40 | 380 | 1260 | 250 | 1890 | 40 | 30 | 580 | 580 | 1110 | <100 |
| HOLDING POND | 12/12/2014 | <20 | <50 | 380 | <50 | 380 | <20 | <20 | <100 | <100 | 380 | <100 |
| POND_1 | 22/04/2015 | <20 | <50 | - | 100 | 550 | <20 | <20 | <100 | <100 | 470 | <100 |
| STREAM 3 | 1/09/2014 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 |
| BREAKFAST CK | 12/12/2014 | <20 | <50 | <100 | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 |
| STREAM 3 | 22/04/2015 | <20 | <50 | - | <50 | <50 | <20 | <20 | <100 | <100 | <100 | <100 |

| Field ID | Sampled_Date-Time | Area | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | Xylene (o) (µg/L) | Xylene (m & p) (µg/L) | Xylene Total (µg/L) | BTEX (µg/L) | Naphthalene (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | BTEX | | | | | | | Naphthalene |
| EQL | | | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| ANZECC 2000 FW 95% (metals ** are hardness adjusted using mean hardness va | | | 950 | | | 350 | | | | 16 |
| S1 | 18/11/2013 | Retention Pond | <1 | 5 | <2 | 3 | 5 | 8 | 13 | 6 |
| DAM SPRAY | 14/04/2014 | Retention Pond | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <5 |
| Pond 2 | 1/09/2014 | Retention Pond | <1 | 6 | <2 | 3 | 4 | 7 | 13 | <1 |
| POND_1 | 1/09/2014 | Retention Pond | <1 | 6 | <2 | 4 | 4 | 8 | 14 | <5 - 1.1 |
| HOLDING POND | 12/12/2014 | Retention Pond | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <2 |
| POND_1 | 22/04/2015 | Retention Pond | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <1 |
| STREAM 3 | 1/09/2014 | Up Stream | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <1 |
| BREAKFAST CK | 12/12/2014 | Up Stream | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <2 |
| STREAM 3 | 22/04/2015 | Up Stream | <1 | <2 | <2 | <2 | <2 | <2 | <1 | <1 |

Metals

| Field ID | Lead (µg/l) | Lead (Filtered) (µg/l) | Aluminium (µg/L) | Aluminium (Filtered) (µg/L) | Arsenic (µg/L) | Arsenic (Filtered) (µg/L) | Cadmium (µg/L) | Cadmium (Filtered) (µg/L) | Chromium (µg/L) | Chromium (Filtered) (µg/L) | Cobalt (µg/L) | Cobalt (Filtered) (µg/L) | Copper (µg/L) | Copper (Filtered) (µg/L) | Iron (µg/L) | Iron (Filtered) (µg/L) | Lithium (mg/L) | Lithium (Filtered) (mg/L) | Manganese (µg/L) | Manganese (Filtered) (µg/L) | Mercury (µg/L) | Mercury (Filtered) (µg/L) | Molybdenum (µg/L) | Molybdenum (Filtered) (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EQL | 1 | 1 | 10 | 10 | 1 | 1 | 0.1 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 50 | 50 | 0.001 | 0.001 | 1 | 1 | 0.1 | 0.1 | 1 | 1 |
| ANZECC 2000 FW 95% | 34 | 34 | 55 | 55 | 13 | 13 | 0.95 | 0.95 | 1 | | | | 4.99 | 4.99 | | | | | 1900 | 1900 | 0.6 | 0.6 | | |
| S1 | 301 | 5 | 1420 | 50 | - | - | - | - | 16 | 2 | 2 | <1 | 210 | 1 | 5540 | 600 | 0.103 | 0.09 | 354 | 285 | - | - | 21 | 19 |
| DAM SPRAY | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pond 2 | 164 | - | - | - | 3 | - | 1.1 | - | 6 | - | - | - | 35 | - | - | - | - | - | - | - | 0.1 | - | - | - |
| POND_1 | 257 | - | - | - | 4 | - | 1.7 | - | 12 | - | - | - | 57 | - | - | - | - | - | - | - | 0.2 | - | - | - |
| HOLDING POND | 27 | - | 360 | - | 2 | - | 0.3 | - | 2 | - | <1 | - | 10 | - | 1320 | - | 0.088 | - | 125 | - | <0.1 | - | 36 | - |
| POND_1 | - | <1 | - | 20 | - | <1 | - | <0.1 | - | 1 | - | <1 | - | <1 | - | - | - | 0.066 | - | 206 | - | <0.1 | - | 44 |
| STREAM 3 | <1 | - | - | - | <1 | - | <0.1 | - | <1 | - | - | - | 3 | - | - | - | - | - | - | - | <0.1 | - | - | - |
| BREAKFAST CK | 8 | - | 6100 | - | 4 | - | <0.1 | - | 9 | - | 4 | - | 17 | - | 8870 | - | 0.008 | - | 142 | - | <0.1 | - | 1 | - |
| STREAM 3 | - | <1 | - | 60 | - | 3 | - | <0.1 | - | 3 | - | <1 | - | 5 | - | - | - | 0.002 | - | 26 | - | <0.1 | - | <1 |

| Field ID | Nickel (µg/L) | Nickel (Filtered) (µg/L) | Phosphorus (mg/L) | Selenium (µg/L) | Selenium (Filtered) (µg/L) | Silver (mg/L) | Silver (Filtered) (mg/L) | Strontium (mg/L) | Strontium (Filtered) (mg/L) | Thallium (mg/L) | Thallium (Filtered) (mg/L) | Tin (µg/L) | Tin (Filtered) (µg/L) | Titanium (mg/L) | Titanium (Filtered) (mg/L) | Vanadium (mg/L) | Vanadium (Filtered) (mg/L) | Zinc (µg/L) | Zinc (Filtered) (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EQL | 1 | 1 | 0.01 | 10 | 10 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 1 | 1 | 0.01 | 0.01 | 0.01 | 0.01 | 5 | 5 |
| ANZECC 2000 FW 95% | 29 | 29 | | 11 | 11 | 0.00005 | 0.00005 | | | | | | | | | | | 22 | 22 |
| S1 | 21 | 10 | 0.8 | <10 | <10 | 0.002 | <0.001 | 0.307 | 0.269 | <0.001 | <0.001 | 3 | <1 | 0.03 | <0.01 | <0.01 | <0.01 | 1840 | 25 |
| DAM SPRAY | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Pond 2 | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 670 | - |
| POND_1 | 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 974 | - |
| HOLDING POND | 11 | - | 0.26 | <10 | - | <0.001 | - | 0.419 | - | <0.001 | - | <1 | - | <0.01 | - | <0.01 | - | 203 | - |
| POND_1 | - | <1 | - | - | <10 | - | <0.001 | - | 0.492 | - | - | - | <1 | - | <0.01 | - | <0.01 | - | 91 |
| STREAM 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 27 | - |
| BREAKFAST CK | 7 | - | 0.18 | <10 | - | <0.001 | - | 0.169 | - | <0.001 | - | <1 | - | 0.04 | - | 0.01 | - | 75 | - |
| STREAM 3 | - | <1 | - | - | <10 | - | <0.001 | - | 0.101 | - | - | - | <1 | - | <0.01 | - | <0.01 | - | 22 |

**Table B2 Results of volume modelling to determine retention volume required**

| Input variables | value | unit |
|---|---|---|
| Pond minimum vol (pump requirements) | 1000 | |
| Pond volume (user set) | 8064 | m3 |
| Tertiary treatment rate | 86.4 | m3/hr |
| Assumed site usage | 12.5 | m3/hr |
| Total "dirty" catchment area | 37659.47 | m2 |
| Run-off coeffient for hard standing / roof (Blue Book) | 0.9 | |

**Results** All values in m3. Negative overflow value equal to remaining capacity in pond (ie. positive value indicates overflow

| | 1 in 100 6hrs | | 1 in 100 12hrs | | 1 in 100 24hrs | | 1 in 100 48hrs | | 1 in 100 72hrs | | 1 in 50 24hrs | | 1 in 50 48hrs | | 1 in 50 72hrs | | 1 in 20 24hrs | | 1 in 20 48hrs | | 1 in 20 72hrs | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hours** | **total vol in pond** | **Overflow** | **total vol in** | **Overflow** | **total vol in po** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** | **total vol in** | **Overflow** |
| 1 | 1686.372324 | -6377.63 | 1428.782 | -6635.22 | 1259.313935 | -6804.69 | 1142.381 | -6921.62 | 1088.491 | -6975.51 | 1221.692 | -6842.31 | 1116.283 | -6947.72 | 1067.816 | -6996.18 | 1173.563 | -6890.44 | 1082.729 | -6981.27 | 1041.379 | -7022.62 |
| 2 | 2372.744649 | -5691.26 | 1857.563 | -6206.44 | 1518.627869 | -6545.37 | 1284.763 | -6779.24 | 1176.981 | -6887.02 | 1443.384 | -6620.62 | 1232.567 | -6831.43 | 1135.631 | -6928.37 | 1347.127 | -6716.87 | 1165.457 | -6898.54 | 1082.757 | -6981.24 |
| 3 | 3059.116973 | -5004.88 | 2286.345 | -5777.66 | 1777.941804 | -6286.06 | 1427.144 | -6636.86 | 1265.472 | -6798.53 | 1665.076 | -6398.92 | 1348.85 | -6715.15 | 1203.447 | -6860.55 | 1520.69 | -6543.31 | 1248.186 | -6815.81 | 1124.136 | -6939.86 |
| 4 | 3745.489298 | -4318.51 | 2715.126 | -5348.87 | 2037.255738 | -6026.74 | 1569.525 | -6494.47 | 1353.962 | -6710.04 | 1886.768 | -6177.23 | 1465.133 | -6598.87 | 1271.262 | -6792.74 | 1694.253 | -6369.75 | 1330.915 | -6733.09 | 1165.514 | -6898.49 |
| 5 | 4431.861622 | -3632.14 | 3143.908 | -4920.09 | 2296.569673 | -5767.43 | 1711.906 | -6352.09 | 1442.453 | -6621.55 | 2108.461 | -5955.54 | 1581.416 | -6482.58 | 1339.078 | -6724.92 | 1867.817 | -6196.18 | 1413.643 | -6650.36 | 1206.893 | -6857.11 |
| 6 | 5118.233946 | -2945.77 | 3572.689 | -4491.31 | 2555.883608 | -5508.12 | 1854.288 | -6209.71 | 1530.943 | -6533.06 | 2330.153 | -5733.85 | 1697.7 | -6366.3 | 1406.893 | -6657.11 | 2041.38 | -6022.62 | 1496.372 | -6567.63 | 1248.271 | -6815.73 |
| 7 | | | 4001.471 | -4062.53 | 2815.197542 | -5248.8 | 1996.669 | -6067.33 | 1619.434 | -6444.57 | 2551.845 | -5512.16 | 1813.983 | -6250.02 | 1474.709 | -6589.29 | 2214.943 | -5849.06 | 1579.101 | -6484.9 | 1289.65 | -6774.35 |
| 8 | | | 4430.252 | -3633.75 | 3074.511477 | -4989.49 | 2139.05 | -5924.95 | 1707.925 | -6356.08 | 2773.537 | -5290.46 | 1930.266 | -6133.73 | 1542.524 | -6521.48 | 2388.507 | -5675.49 | 1661.829 | -6402.17 | 1331.029 | -6732.97 |
| 9 | | | 4859.034 | -3204.97 | 3333.825411 | -4730.17 | 2281.432 | -5782.57 | 1796.415 | -6267.58 | 2995.229 | -5068.77 | 2046.549 | -6017.45 | 1610.34 | -6453.66 | 2562.07 | -5501.93 | 1744.558 | -6319.44 | 1372.407 | -6691.59 |
| 10 | | | 5287.815 | -2776.18 | 3593.139346 | -4470.86 | 2423.813 | -5640.19 | 1884.906 | -6179.09 | 3216.921 | -4847.08 | 2162.833 | -5901.17 | 1678.155 | -6385.84 | 2735.633 | -5328.37 | 1827.287 | -6236.71 | 1413.786 | -6650.21 |
| 11 | | | 5716.597 | -2347.4 | 3852.453281 | -4211.55 | 2566.194 | -5497.81 | 1973.396 | -6090.6 | 3438.613 | -4625.39 | 2279.116 | -5784.88 | 1745.971 | -6318.03 | 2909.197 | -5154.8 | 1910.015 | -6153.98 | 1455.164 | -6608.84 |
| 12 | | | 6145.379 | -1918.62 | 4111.767215 | -3952.23 | 2708.575 | -5355.42 | 2061.887 | -6002.11 | 3660.305 | -4403.69 | 2395.399 | -5668.6 | 1813.786 | -6250.21 | 3082.76 | -4981.24 | 1992.744 | -6071.26 | 1496.543 | -6567.46 |
| 13 | | | | | 4371.08115 | -3692.92 | 2850.957 | -5213.04 | 2150.378 | -5913.62 | 3881.998 | -4182 | 2511.682 | -5552.32 | 1881.602 | -6182.4 | 3256.323 | -4807.68 | 2075.473 | -5988.53 | 1537.922 | -6526.08 |
| 14 | | | | | 4630.395084 | -3433.6 | 2993.338 | -5070.66 | 2238.868 | -5825.13 | 4103.69 | -3960.31 | 2627.966 | -5436.03 | 1949.417 | -6114.58 | 3429.886 | -4634.11 | 2158.202 | -5905.8 | 1579.3 | -6484.7 |
| 15 | | | | | 4889.709019 | -3174.29 | 3135.719 | -4928.28 | 2327.359 | -5736.64 | 4325.382 | -3738.62 | 2744.249 | -5319.75 | 2017.233 | -6046.77 | 3603.45 | -4460.55 | 2240.93 | -5823.07 | 1620.679 | -6443.32 |
| 16 | | | | | 5149.022954 | -2914.98 | 3278.1 | -4785.9 | 2415.849 | -5648.15 | 4547.074 | -3516.93 | 2860.532 | -5203.47 | 2085.048 | -5978.95 | 3777.013 | -4286.99 | 2323.659 | -5740.34 | 1662.057 | -6401.94 |
| 17 | | | | | 5408.336888 | -2655.66 | 3420.482 | -4643.52 | 2504.34 | -5559.66 | 4768.766 | -3295.23 | 2976.816 | -5087.18 | 2152.864 | -5911.14 | 3950.576 | -4113.42 | 2406.388 | -5657.61 | 1703.436 | -6360.56 |
| 18 | | | | | 5667.650823 | -2396.35 | 3562.863 | -4501.14 | 2592.83 | -5471.17 | 4990.458 | -3073.54 | 3093.099 | -4970.9 | 2220.68 | -5843.32 | 4124.14 | -3939.86 | 2489.116 | -5574.88 | 1744.814 | -6319.19 |
| 19 | | | | | 5926.964757 | -2137.04 | 3705.244 | -4358.76 | 2681.321 | -5382.68 | 5212.15 | -2851.85 | 3209.382 | -4854.62 | 2288.495 | -5775.5 | 4297.703 | -3766.3 | 2571.845 | -5492.16 | 1786.193 | -6277.81 |
| 20 | | | | | 6186.278692 | -1877.72 | 3847.626 | -4216.37 | 2769.812 | -5294.19 | 5433.842 | -2630.16 | 3325.665 | -4738.33 | 2356.311 | -5707.69 | 4471.266 | -3592.73 | 2654.574 | -5409.43 | 1827.572 | -6236.43 |
| 21 | | | | | 6445.592627 | -1618.41 | 3990.007 | -4073.99 | 2858.302 | -5205.7 | 5655.535 | -2408.47 | 3441.949 | -4622.05 | 2424.126 | -5639.87 | 4644.83 | -3419.17 | 2737.302 | -5326.7 | 1868.95 | -6195.05 |
| 22 | | | | | 6704.906561 | -1359.09 | 4132.388 | -3931.61 | 2946.793 | -5117.21 | 5877.227 | -2186.77 | 3558.232 | -4505.77 | 2491.942 | -5572.06 | 4818.393 | -3245.61 | 2820.031 | -5243.97 | 1910.329 | -6153.67 |
| 23 | | | | | 6964.220496 | -1099.78 | 4274.769 | -3789.23 | 3035.283 | -5028.72 | 6098.919 | -1965.08 | 3674.515 | -4389.48 | 2559.757 | -5504.24 | 4991.956 | -3072.04 | 2902.76 | -5161.24 | 1951.707 | -6112.29 |
| 24 | | | | | 7223.53443 | -840.466 | 4417.151 | -3646.85 | 3123.774 | -4940.23 | 6320.611 | -1743.39 | 3790.798 | -4273.2 | 2627.573 | -5436.43 | 5165.52 | -2898.48 | 2985.488 | -5078.51 | 1993.086 | -6070.91 |
| 25 | | | | | | | 4559.532 | -3504.47 | 3212.264 | -4851.74 | | | 3907.082 | -4156.92 | 2695.388 | -5368.61 | | | 3068.217 | -4995.78 | 2034.465 | -6029.54 |
| 26 | | | | | | | 4701.913 | -3362.09 | 3300.755 | -4763.24 | | | 4023.365 | -4040.64 | 2763.204 | -5300.8 | | | 3150.946 | -4913.05 | 2075.843 | -5988.16 |
| 27 | | | | | | | 4844.295 | -3219.71 | 3389.246 | -4674.75 | | | 4139.648 | -3924.35 | 2831.019 | -5232.98 | | | 3233.674 | -4830.33 | 2117.222 | -5946.78 |
| 28 | | | | | | | 4986.676 | -3077.32 | 3477.736 | -4586.26 | | | 4255.931 | -3808.07 | 2898.835 | -5165.17 | | | 3316.403 | -4747.6 | 2158.6 | -5905.4 |
| 29 | | | | | | | 5129.057 | -2934.94 | 3566.227 | -4497.77 | | | 4372.215 | -3691.79 | 2966.65 | -5097.35 | | | 3399.132 | -4664.87 | 2199.979 | -5864.02 |
| 30 | | | | | | | 5271.438 | -2792.56 | 3654.717 | -4409.28 | | | 4488.498 | -3575.5 | 3034.466 | -5029.53 | | | 3481.86 | -4582.14 | 2241.357 | -5822.64 |
| 31 | | | | | | | 5413.82 | -2650.18 | 3743.208 | -4320.79 | | | 4604.781 | -3459.22 | 3102.281 | -4961.72 | | | 3564.589 | -4499.41 | 2282.736 | -5781.26 |
| 32 | | | | | | | 5556.201 | -2507.8 | 3831.699 | -4232.3 | | | 4721.065 | -3342.94 | 3170.097 | -4893.9 | | | 3647.318 | -4416.68 | 2324.115 | -5739.89 |
| 33 | | | | | | | 5698.582 | -2365.42 | 3920.189 | -4143.81 | | | 4837.348 | -3226.65 | 3237.912 | -4826.09 | | | 3730.046 | -4333.95 | 2365.493 | -5698.51 |
| 34 | | | | | | | 5840.964 | -2223.04 | 4008.68 | -4055.32 | | | 4953.631 | -3110.37 | 3305.728 | -4758.27 | | | 3812.775 | -4251.22 | 2406.872 | -5657.13 |
| 35 | | | | | | | 5983.345 | -2080.66 | 4097.17 | -3966.83 | | | 5069.914 | -2994.09 | 3373.544 | -4690.46 | | | 3895.504 | -4168.5 | 2448.25 | -5615.75 |
| 36 | | | | | | | 6125.726 | -1938.27 | 4185.661 | -3878.34 | | | 5186.198 | -2877.8 | 3441.359 | -4622.64 | | | 3978.232 | -4085.77 | 2489.629 | -5574.37 |
| 37 | | | | | | | 6268.107 | -1795.89 | 4274.151 | -3789.85 | | | 5302.481 | -2761.52 | 3509.175 | -4554.83 | | | 4060.961 | -4003.04 | 2531.008 | -5532.99 |
| 38 | | | | | | | 6410.489 | -1653.51 | 4362.642 | -3701.36 | | | 5418.764 | -2645.24 | 3576.99 | -4487.01 | | | 4143.69 | -3920.31 | 2572.386 | -5491.61 |
| 39 | | | | | | | 6552.87 | -1511.13 | 4451.133 | -3612.87 | | | 5535.047 | -2528.95 | 3644.806 | -4419.19 | | | 4226.419 | -3837.58 | 2613.765 | -5450.24 |
| 40 | | | | | | | 6695.251 | -1368.75 | 4539.623 | -3524.38 | | | 5651.331 | -2412.67 | 3712.621 | -4351.38 | | | 4309.147 | -3754.85 | 2655.143 | -5408.86 |
| 41 | | | | | | | 6837.632 | -1226.37 | 4628.114 | -3435.89 | | | 5767.614 | -2296.39 | 3780.437 | -4283.56 | | | 4391.876 | -3672.12 | 2696.522 | -5367.48 |
| 42 | | | | | | | 6980.014 | -1083.99 | 4716.604 | -3347.4 | | | 5883.897 | -2180.1 | 3848.252 | -4215.75 | | | 4474.605 | -3589.4 | 2737.9 | -5326.1 |
| 43 | | | | | | | 7122.395 | -941.605 | 4805.095 | -3258.91 | | | 6000.181 | -2063.82 | 3916.068 | -4147.93 | | | 4557.333 | -3506.67 | 2779.279 | -5284.72 |
| 44 | | | | | | | 7264.776 | -799.224 | 4893.585 | -3170.41 | | | 6116.464 | -1947.54 | 3983.883 | -4080.12 | | | 4640.062 | -3423.94 | 2820.658 | -5243.34 |
| 45 | | | | | | | 7407.158 | -656.842 | 4982.076 | -3081.92 | | | 6232.747 | -1831.25 | 4051.699 | -4012.3 | | | 4722.791 | -3341.21 | 2862.036 | -5201.96 |
| 46 | | | | | | | 7549.539 | -514.461 | 5070.567 | -2993.43 | | | 6349.03 | -1714.97 | 4119.514 | -3944.49 | | | 4805.519 | -3258.48 | 2903.415 | -5160.59 |
| 47 | | | | | | | 7691.92 | -372.08 | 5159.057 | -2904.94 | | | 6465.314 | -1598.69 | 4187.33 | -3876.67 | | | 4888.248 | -3175.75 | 2944.793 | -5119.21 |
| 48 | | | | | | | 7834.301 | -229.699 | 5247.548 | -2816.45 | | | 6581.597 | -1482.4 | 4255.145 | -3808.85 | | | 4970.977 | -3093.02 | 2986.172 | -5077.83 |
| 49 | | | | | | | | | 5336.038 | -2727.96 | | | | | 4322.961 | -3741.04 | | | | | 3027.551 | -5036.45 |
| 50 | | | | | | | | | 5424.529 | -2639.47 | | | | | 4390.776 | -3673.22 | | | | | 3068.929 | -4995.07 |
| 51 | | | | | | | | | 5513.02 | -2550.98 | | | | | 4458.592 | -3605.41 | | | | | 3110.308 | -4953.69 |
| 52 | | | | | | | | | 5601.51 | -2462.49 | | | | | 4526.408 | -3537.59 | | | | | 3151.686 | -4912.31 |
| 53 | | | | | | | | | 5690.001 | -2374 | | | | | 4594.223 | -3469.78 | | | | | 3193.065 | -4870.94 |
| 54 | | | | | | | | | 5778.491 | -2285.51 | | | | | 4662.039 | -3401.96 | | | | | 3234.443 | -4829.56 |
| 55 | | | | | | | | | 5866.982 | -2197.02 | | | | | 4729.854 | -3334.15 | | | | | 3275.822 | -4788.18 |
| 56 | | | | | | | | | 5955.472 | -2108.53 | | | | | 4797.67 | -3266.33 | | | | | 3317.201 | -4746.8 |
| 57 | | | | | | | | | 6043.963 | -2020.04 | | | | | 4865.485 | -3198.51 | | | | | 3358.579 | -4705.42 |
| 58 | | | | | | | | | 6132.454 | -1931.55 | | | | | 4933.301 | -3130.7 | | | | | 3399.958 | -4664.04 |
| 59 | | | | | | | | | 6220.944 | -1843.06 | | | | | 5001.116 | -3062.88 | | | | | 3441.336 | -4622.66 |
| 60 | | | | | | | | | 6309.435 | -1754.57 | | | | | 5068.932 | -2995.07 | | | | | 3482.715 | -4581.29 |
| 61 | | | | | | | | | 6397.925 | -1666.07 | | | | | 5136.747 | -2927.25 | | | | | 3524.093 | -4539.91 |
| 62 | | | | | | | | | 6486.416 | -1577.58 | | | | | 5204.563 | -2859.44 | | | | | 3565.472 | -4498.53 |
| 63 | | | | | | | | | 6574.906 | -1489.09 | | | | | 5272.378 | -2791.62 | | | | | 3606.851 | -4457.15 |
| 64 | | | | | | | | | 6663.397 | -1400.6 | | | | | 5340.194 | -2723.81 | | | | | 3648.229 | -4415.77 |
| 65 | | | | | | | | | 6751.888 | -1312.11 | | | | | 5408.009 | -2655.99 | | | | | 3689.608 | -4374.39 |
| 66 | | | | | | | | | 6840.378 | -1223.62 | | | | | 5475.825 | -2588.18 | | | | | 3730.986 | -4333.01 |
| 67 | | | | | | | | | 6928.869 | -1135.13 | | | | | 5543.64 | -2520.36 | | | | | 3772.365 | -4291.64 |
| 68 | | | | | | | | | 7017.359 | -1046.64 | | | | | 5611.456 | -2452.54 | | | | | 3813.744 | -4250.26 |
| 69 | | | | | | | | | 7105.85 | -958.15 | | | | | 5679.272 | -2384.73 | | | | | 3855.122 | -4208.88 |
| 70 | | | | | | | | | 7194.341 | -869.659 | | | | | 5747.087 | -2316.91 | | | | | 3896.501 | -4167.5 |
| 71 | | | | | | | | | 7282.831 | -781.169 | | | | | 5814.903 | -2249.1 | | | | | 3937.879 | -4126.12 |
| 72 | | | | | | | | | 7371.322 | -692.678 | | | | | 5882.718 | -2181.28 | | | | | 3979.258 | -4084.74 |

Annex C

# Stormwater Treatment Plant Specifications

# SPEL ECOCEPTOR™: Technical Profile

## Executive Summary

The technical profile details the water quality performance, function mechanics, and maintenance criteria of the SPEL Ecoceptor™, and is to be read in conjunction with submissions containing the Ecoceptor™ including quotations and proposals that have been designed by consulting engineers for specific catchment treatment designs, and for when the MUSIC node is employed.

The SPEL Ecoceptor™ is a secondary treatment stormwater treatment device or is more commonly referred to as a Stormwater Quality Improvement Device (SQID).
It is fibreglass, self-contained, one-piece construction and is suitable for impervious catchments for the reduction of sediment, total suspended solids (TSS), nutrients, Total Petroleum Hydrocarbons (TPH), oil & grease for surface water runoff from impervious catchments.

## SPEL Ecoceptor™ Treatment Dynamics

The SPEL Ecoceptor™ is a hydrodynamic stormwater quality improvement device (SQID) that has a unique treatment action producing low velocity conditions producing discharge water quality outcomes complying with statutory guidelines across Australia.
It has been independently tested in Australia and is suitable for all types of conditions and soil-type loadings.
Low velocity flow produces quiescent conditions enabling separation of pollutants in all flow events. Contaminated water cannot flow directly across the surface before effective separation has taken place.

**Treatment Flow (TFR)**
It separates and captures sediments, silt, total suspended solids, nutrients, total petroleum hydrocarbons (TPH) and oil & grease.
TPH and oil & grease rise to the `oil-capture` zone of the treatment chamber and are contained in all flow events.
Captured pollutants cannot resuspend or scour from the treatment chamber in all flow events.

**Bypass Flow**
In high flow conditions (storm event) flow passes through the internal pipe weir bypassing the treatment separation chamber.

**Continual & Optimal Treatment Performance**
The bypass flow action ensures that quiescent conditions are maintained in the treatment separation chamber, (no turbulence or agitation) ensuring optimal treatment performance especially whilst the device is in `bypass mode`.

**No Scouring or Re-suspension**
The SPEL Ecoceptor™ treatment function ensures there is no scouring or re-suspension of separated pollutants, in all flow events.

## Performance Analysis

**University of South Australia flow test analysis**
SPEL Ecoceptor™ devices have undergone rigorous and comprehensive testing for total suspended solids, total phosphorus. The reduction values listed within are from flow tests conducted by the University of South Australia Hydraulics Research Laboratory (UNISA)

**Total Suspended Solids: Particle Size Distribution (PSD)**
The make-up of particulate size was weighted fine fraction <125um which makes up 90% of the load reflecting MUSIC load characteristics. The test was conducted at the UNISA research facility with the device in flow mode. This is stressed as the most accurate method in determining reduction as opposed to accumulative loads analysis.
In summary the reduction of **Total Suspended Solids:** particle size distribution (PSD)

- >97% >75um.
- >35% <75um.

**TSS UNISA Test Methodology**

The sediment added to the inlet of the SPEL Ecoceptor™ consisted of 10 kg of dry material. Half of this material (by weight) was a sand material sourced from a brick sand quarrying operation in Noarlunga, SA which was pre-sieved to remove particles finer than 600 µm. The second half (by weight) was a commercially sourced silica product (Unimin Silica 60G). The particle size distribution (PSD) of the sediment produced was determined to 75 µm by sieving in accordance with AS 1289.3.6.1 – 2009 prior to adding the material to the concentrated pollutant mixture. The PSD of material less than 75 µm was determined using laser diffraction.

At the completion of the test the suspended solids retained by treatment separation chamber of the SPEL Ecoceptor™ device were collected. The collected sediment was harvested by draining all water from the tank at the completion of the test through a geo-fabric filter to manually collect retained sediment. Retained sediment was then dried in the oven at 105°C and sieved to 75 µm in accordance with AS 1289.3.6.1 – 2009. The sediment fraction which was not collected was assumed to pass through the tank in normal running conditions.

Although the loss of retained sediment during the retained sediment collection method is considered possible, it was considered appropriate because this method represents a conservative approach to determining the total mass of retained sediment as losses are considered to pass through the SPEL Ecoceptor™. Furthermore, as sediment that is lost through the cloth filter is most likely to be in the smaller particle size range, this added a further degree of conservatism as it leads to an under-estimation of the amount of retained low diameter particles.

**TSS Results**

Overall, 10 kg of sediment was added to the SPEL Ecoceptor™ device, and 8.486 kg of sediment was retained.

Analysis of the PSD of sediment indicated that the retained sediment was predominantly larger particle sizes. The SPEL Ecoceptor™ removed more than 97% of sediment larger than 75 µm, and more than 35% of the particles less than 75 µm.

Figure 1 compares the inlet PSD of sediment used in this test with the assumed PSD of sediment in the MUSIC model. The comparison indicates that there was generally a broader PSD distribution than that assumed by the MUSIC software.

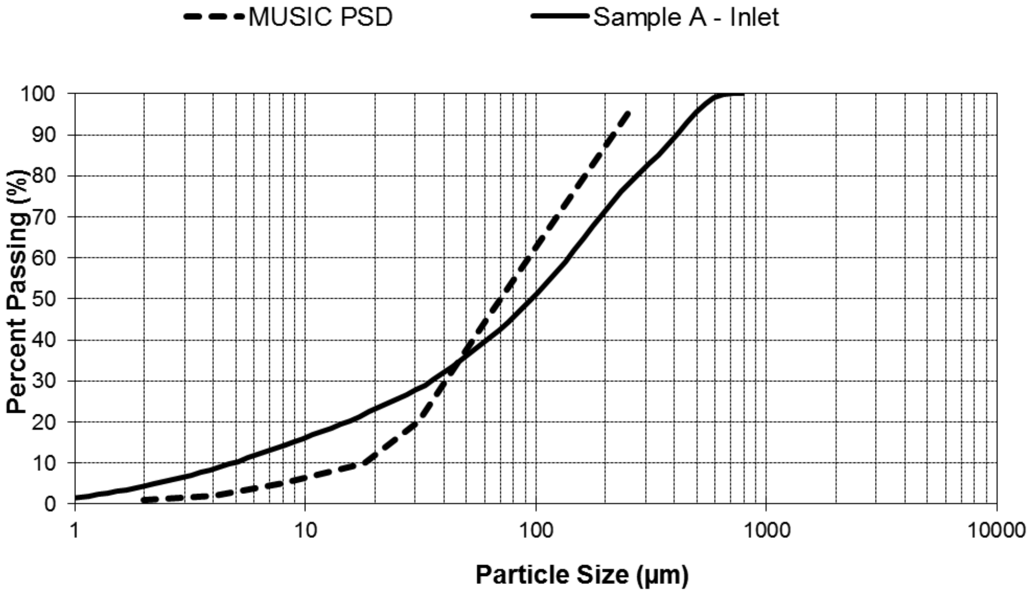


**Figure 1 - Test: PSD of sediment at the inlet of the SPEL Ecoceptor™ compared to that assumed in the MUSIC model (by laser diffraction)**

**Total Phosphorus**
Tests were performed in flow mode at the UNISA Research facility and in-situ capture tests of units treating a commercial/mixed subdivision with removal particulate-bound.
Reduction of **Total Phosphorus** (TP)

- >30% (Annexure are available for validation)

**Site Tests: TSS, TP, TN.**

SPEL engages site tests for water quality of the Ecoceptor™ devices continually across a wide spectrum of catchments on Australia`s east coast. Annexures are available to demonstrate independently analysed data for TSS, TP & TN.

**TSS**

The catchments for these sites tests are typically a mixed commercial/industrial subdivision with a typical suburban streetscape. The TSS inflow concentration is >500mg/l (upper Fletcher et al [2004]). This is due to the catchments being flat with a gradient of <0.5% and the presence of gravel streets, excavated allotments and some construction activity within the catchment at the time of testing periods.
The data reveals a consistent reduction of >95% of TSS.

**Total Nitrogen**
Site tests show removal rates (particulate) are achievable to 30% from inflow concentration levels of `typical-type` levels in the region of 2mg/l. (Fletcher et al [2004]).

**Gross Pollutants**

- SPEL Class 1™ retains >90% of gross pollutants >3mm size in treatable flow conditions.

**Installation**

The SPEL Ecoceptor™ given its lightweight yet robust design is significantly easier to install than other concrete constructed SQID's. Typical empty masses range from 300-800 kgs. This means that no heavy cranes are required.

Furthermore, the one-piece construction means that no onsite assembly is required therefore pipe connection & backfilling of unit can commence immediately.

More detailed instructions can be found in the "installation" section of the O & M manual.

**Maintenance Operation**
Maintenance is performed at minimum every twelve months depending on site conditions.

The cylindrical shape of the SPEL Ecoceptor™ with its sloped cone-configured base ensures sediment accretes at the centre of the SQID`s base affording easy and simple cleaning.

The fibreglass gel coat ensures that oil & grease are removed without sticking to the sides of the internal walls.
Sediment is removed by a vacuum loading truck from the base of the primary chamber. The cylindrical shape ensures sediment collects at the base of the chamber.

**Operation & Maintenance Manual:** The Maintenance Programme will be kept on the premises at all times, with a ledger recording all maintenance and inspection activities. This will provide a useful and efficient record for Council Inspection officers to facilitate random verification.

**Life Span**
SPEL Ecoceptor™ has a life span in excess of 50 years

# SPEL STORMCEPTOR CLASS 1: Technical Profile

The SPEL Stormceptor Class 1 is gravity, passive stormwater treatment device that treats stormwater through two chambers. Low velocity flow produces quiescent conditions enabling separation of the pollutants in all flow events. Contaminated water cannot flow directly across the surface before effective separation has taken place.

## SPEL Class 1 Treatment Dynamics

**Treatment Flow (TFR)**
Treatment flow (TFR) enters the primary chamber where sediment is collected. Flow then passes into the secondary separation chamber (Quiescent Zone) and finally through a high-reticulated coalescing media trapping and separating fine particulate suspended solids, nutrients and hydrocarbons.
**Bypass Flow**
In high flow conditions (storm event) flow is through the primary chamber only, bypassing the secondary separation chamber.
**Continual & Optimal Treatment Performance**
This unique SPEL Class 1 flow action in conjunction with the two internally sealed chambers and filter media maintains the quiescent conditions in the secondary separation chamber, ( no turbulence or agitation )ensuring optimal treatment performance even whilst the device is in `bypass mode`.
**No Scouring or Re-suspension**
The SPEL Class 1 function ensures there is no scouring or re-suspension of separated pollutants. This makes it suitable for flood and tidal zones.

## Performance Analysis

**University of South Australia flow test analysis**
SPEL Class 1 devices have undergone rigorous and comprehensive testing for total suspended solids, total phosphorus and hydrocarbons.
The reduction values listed within are from flow tests conducted by the University of South Australia Hydraulics Research Laboratory (UNISA)

**Total Suspended Solids: Particle Size Distribution (PSD)**
In depth investigation of particle size capture performance was developed for the first time at the UNISA hydraulic research facilities for assessment for typical stormwater TSS characteristics.

The make-up of particulate size was weighted to the fine fraction 8um-75um that is typical of TSS load. The test was conducted at the UNISA research facility with the device in flow mode. This is stressed as the most accurate method in determining reduction as opposed to accumulative loads analysis.
Reduction of **Total Suspended Solids:** particle size distribution (PSD)

- >80% 10um-125um Note 3
- >87% >125um. Note 3

**Total Petroleum Hydrocarbons (TPH)**
Tests were performed at the UNISA Hydraulics Research facility and at HR Wallingford UK with the device in flow mode, with the following results. Test methodology was done to European Standard BS EN 85.1 Section 8.3
Discharge water quality reduction remains constant at <0.1ppm of TPH translating to `no visible trace` from a constant inflow concentration of 5,000ppm.
Data expressed by competitors in terms of percentages are erroneous. Claims expressed in percentage form are unreliable and misleading. A 98% reduction of TPH off catchments with vehicular activity would result in discharge loads ranging from 20ppm to 100ppm. This exceeds the concentration of TPH `visibility` which is approximately 10ppm rendering such devices as non-compliant.
Reduction of **Total Petroleum Hydrocarbons** (TPH)

- `no visible trace` ( 5,000pppm inflow concentration)Note 4

Reduction of fuel/diesel/oils remain a constant level of `no detection` from inflow concentration of >5,000ppm.

**Total Phosphorus**
Tests were performed in flow mode at the UNISA Research facility and in-situ capture tests of units treating a commercial/mixed subdivision.
Reduction of **Total Phosphorus** (TP)

- >45% Note 3

**Total Nitrogen**

- Site tests show removal rates (particulate) are achievable to 45% Note 3.

**Metals**
Site tests of cadmium, chromium, lead, aluminium and zinc show removal rates >90%

**Gross Pollutants**

- SPEL Class 1 retains >90% of gross pollutants >5mm size.

Validation notes are attached.

## Coalescing filter media

The coalescer is a high- reticulated and high-contact surface filter with a minimum life span of eight years.
It is mounted into the secondary chamber, providing a coalescing process for the separation of smaller oil droplets.
It is effective in trapping and retaining TSS fine particulate. Incorporated in the secondary chamber prevents the coalescer from being blocked by large amounts of heavy sediment that are separated in the primary chamber.
It can be simply lifted out for cleaning during routine maintenance.

## Tank Structure-Certification & Manufacture

***Stormceptor Class 1*** units are glass reinforced plastic vessels made by the technical advanced chop hoop filament winding process (patented) producing circumferential and longitudinal strength complying with *BS4994 FRP Pressure Vessel* code and *AS 2634FRP Chemical Equipment* to ensure the construction meets the necessary strength and stability requirements. The tank is designed to accept ground conditions with low stiffness down to 4.8MPa, water tables are set to ground level as standard with a minimum depth of cover, based on a standard soil density.

## Maintenance Operation

Maintenance is performed at minimum every twelve months depending on site conditions.
**Coalescer:** Suspend the coalescer above the secondary chamber and flush contaminants into the chamber using only garden hose pressure. This will ensure no release of pollutants into the surrounding environment.
**Sediment:** Sediment is removed by a vacuum loading truck from the base of the primary chamber. The cylindrical shape ensures sediment collects at the base of the chamber.
**Hydrocarbons:** Oil/fuel is skimmed from the surface of the water in both chambers, by suction from a vacuum loading truck. The internal `gel-coat` ensures hydrocarbons do not `stick` to the sides of the tank.
**Floatables:** Gross pollutants and litter are removed by the same process described above.
**Operation & Maintenance Manual:** The Maintenance Programme will be kept on the premises at all times, with a ledger recoding all maintenance and inspection activities. This will provide a useful and efficient record for Council Inspection officers to facilitate random verification.

## Life Span

***Stormceptor Class 1*** has a life span in excess of 50 years

# SPELFilter Hydrosystem

Environmentally aware and efficient.

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SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

## The Technology

A specialist rainwater filter, designed for installation within load bearing shafts and chambers of concrete or plastic construction. The pre fitted plastic housing is safe and easy to fit at site.

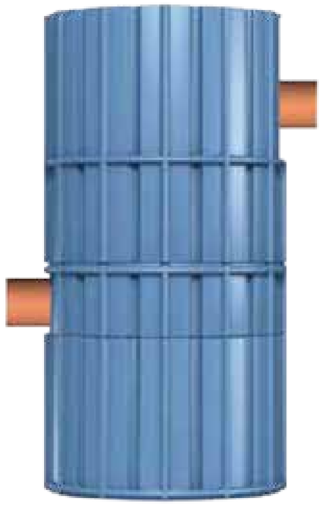
The Hydrosystem 1000 Filter uses an up-flow process. This means there is a minimal head drop between the inlet and the outlet. The cleaned water is of an outstanding water quality. The rainwater is treated within the unit by the following processes: sedimentation, filtration, adsorption and precipitation.

The initial treatment steps take place in the Dynamic Separator, where sedimentation of solid particles occurs within a radial flow regime, characterised by secondary flows.

A settling funnel to the silt trap chamber entrance ensures sediments are not remobilised. Above the separator are the filter inserts, covering the entire diameter of the unit's housing, where the second treatment step takes place.

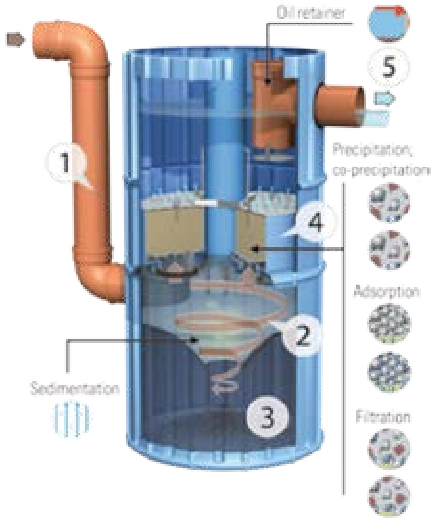
Water flows upwards through the removable filter element. As a result of both the upward flow within the filter element and the fact that the filter remains saturated, the rate of filter clogging by solids is both very limited and slow.

The filter inserts are easy to exchange.



## How it works

1. The stormwater from the drained area is fed into the inlet, which is at the lower end of the shaft. A deflector plate sets up a radial flow.
2. Here, sedimentation of particles, especially the sand faction and above, takes place in the hydrodynamic separator. This is due to turbulent secondary flows within a radial laminar flow regime.
3. The settlable solids are collected via an opening in the silt trap chamber. This chamber is evacuated periodically, via the by-pass central tube at intervals.
4. Four filter elements are located within the filter shaft. As waters flow upwards the finer particles are filtered out, whilst the dissolved pollutants are precipitated and absorbed. The filter is easily backwashed, and if completely clogged or exhausted, is easily replaced.
5. Clean water above the filter elements passes to discharge via an oil trap assembly. In the event of major spill, free floating oils etc are retained here. Normal concentrations of dissolved oils are retained within the filter elements.



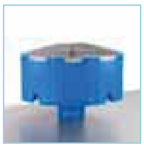

## Technical Data

Stormwater filter complying with DIN 1989-2. Connections: DN 200; the various types of filter elements have different material structures.

Housing material: Polyethylene
Housing weight: 68 kg
Total weight: 220 to 350 kg depending on filter type
**Packing unit SPEL Hydrosystem 1000:** Pallet: 1 piece

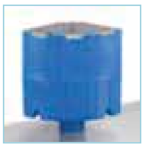
## Accessories 1

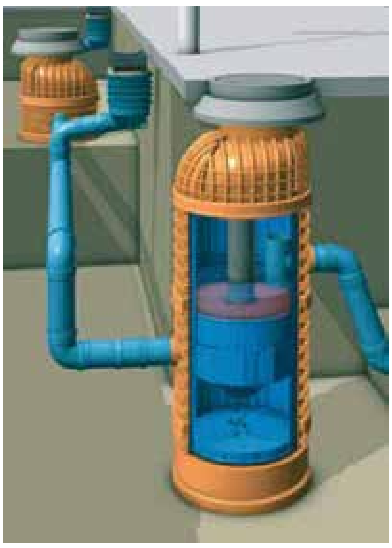
SPELFilter element
Weight per filter element:
34 kg (roof / traffic)



## Accessories 2

SPELFilter element
Weight per filter element:
54 kg (heavy traffic)
66 kg (metal)





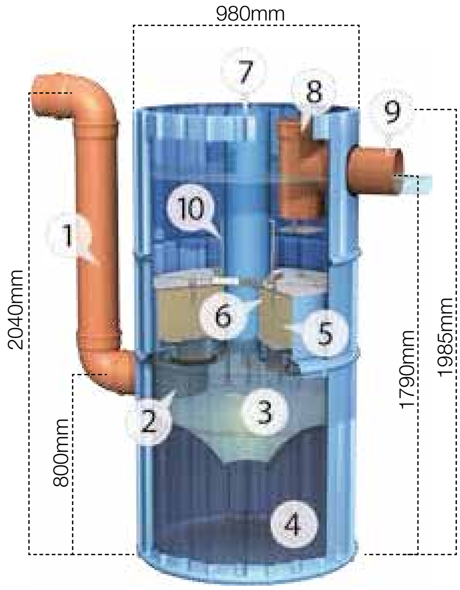
*Example: Installation in a shaft made of plastic*

## Example:

The SPEL Hydrosystem 1000 traffic installed in a concrete shaft DN1000.

## Product structure:

1. Stormwater inlet (DN 200)
2. Deflector plate
3. Hydrodynamic separator
4. Silt trap
5. Filter element
6. Extraction aid for filter element
7. Overflow and suction pipe
8. Oil trap
9. Outlet stormwater storage, soakaway system or surface waters
10. Buoyancy restraint for filter elements




The SPEL Hydrosystem is available with various filter types, depending on the usage of the connected area. The Roof type is used for roof areas that do not have a significant proportion of uncoated metals; the Metal type is employed for metal roof areas, and the Traffic type is used for slightly polluted traffic areas.

The Heavy Traffic type is employed for heavily polluted traffic areas and has been granted general technical approval (Z-84.2-4) by the German Institute for Structural Engineering (DIBt). The maximum areas that may be drained depend on the nature of the surfaces. These are given in the following table.

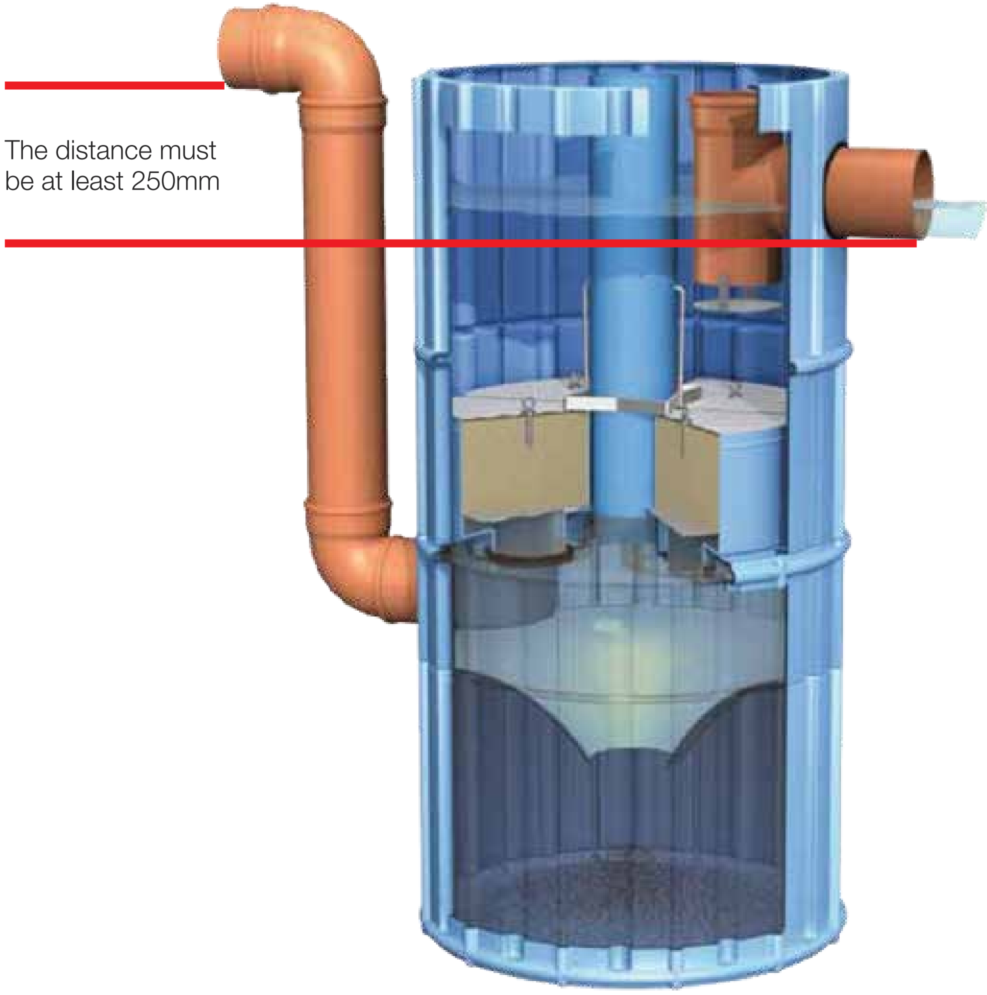
| **Type** | **Nature of the surface to be drained** | **Weight of filter element / piece** | **Total Weight** |
|---|---|---|---|
| Heavy traffic with technical approval (Z-84.2-4) | Highly polluted traffic areas (car parks in front of supermarkets, main roads, HGV access roads) | 54kg | 300kg |
| Traffic | Slightly polluted traffic areas (side streets, staff car parks, yards) | 34kg | 220kg |
| Roof | Roofs without a significant proportion of uncoated metals (< 50m²) | 34kg | 220kg |
| Metal | Roofs made of uncoated metals (copper, zinc, lead) | 66kg | 350kg |

| Parameter | Unit | Non Metal Roof | | Copper Roof | | Zinc Roof | | Parking lot, residential street | | Main road Distributer | | 1 Aims of LAWA | 2 Drinking Water | 3 Seepage | 4 SPEL Hydrosystem |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | from | to | from | to | from | to | from | to | from | to | permissible limit | permissible limit | control value | aim |
| **Phsico-chemical parameters** | | | | | | | | | | | | 90 Percentile | | | |
| electrical conductivity | [uS/cm] | 25 | 270 | 25 | 270 | 25 | 270 | 50 | 2400 | 110 | 2400 | – | 2500 | – | < 1500 |
| pH value | [–] | 4.7 | 6.8 | 4,7 | 6,8 | 4,7 | 6,8 | 6,4 | 7,9 | 6,4 | 7,9 | – | 6,5 – 9,5 | – | 7,0 – 9,5 |
| **Nutrients** | | | | | | | | | | | | | | | |
| phosphorous (P ges) | [mg/l] | 0,06 | 0,50 | 0,06 | 0,50 | 0,06 | 0,50 | 0,09 | 0,30 | 0,23 | 0,34 | – | – | – | 0,20 |
| ammonium ($NH_4$) | [mg/l] | 0,1 | 6,2 | 0,1 | 6,2 | 0,1 | 6,2 | 0,0 | 0,9 | 0,5 | 2,3 | – | 0,5 | – | 0,3 |
| nitrate ($NO_3$) | [mg/l] | 0,1 | 4,7 | 0,1 | 4,7 | 0,1 | 4,7 | 0,0 | 16,0 | 0,0 | 16,0 | – | 50,0 | – | – |
| **Heavy Metals** | | | | | | | | | | | | | | | |
| cadmium (Cd) | [µg/l] | 0,2 | 2,5 | 0,2 | 1,0 | 0,5 | 2,0 | 0,2 | 1,7 | 0,3 | 13,0 | 1,0 | 5,0 | 5,0 | < 1,0 |
| zinc (Zn) | [µg/l] | 24 | 4.880 | 24 | 877 | 1.731 | 43.674 | 15 | 1.420 | 120 | 2.000 | 500 | – | 500 | < 500 |
| copper (Cu) | [µg/l] | 6 | 3.416 | 2.200 | 8.500 | 11 | 950 | 21 | 140 | 97 | 104 | 20 | 2000 | 50 | < 50 |
| lead (Pb) | [µg/l] | 2 | 493 | 2 | 493 | 4 | 302 | 98 | 170 | 11 | 525 | 50 | 10 | 25 | < 25 |
| nickel (Ni) | [µg/l] | 2 | 7 | 2 | 7 | 2 | 7 | 4 | 70 | 4 | 70 | 50 | 20 | 50 | < 20 |
| chromium (Cr) | [µg/l] | 2 | 6 | 2 | 6 | 2 | 6 | 6 | 50 | 6 | 50 | 50 | 50 | 50 | < 50 |
| **Organic Substances** | | | | | | | | | | | | | | | |
| polynuclear aromatic hydrocarbons (PAK) | [ug/l] | 0.4 | 0.6 | 0.4 | 0.6 | 0.4 | 0.6 | 0,2 | 17,1 | 0,2 | 17,1 | – | 0,1 6 compounds | 0,2 | < 0,2 |
| petroleum-derived hydrocarbons (MKW) | [mg/l] | 0,1 | 3,1 | 0,1 | 3,1 | 0,1 | 3,1 | 0,1 | 6,5 | 0,1 | 6,5 | – | – | 0,2 | < 0,2 |

1 Aims of the German working group on water issues of the Federal States and the Federal Government (LAWA) for surface water, usage as potable water (1998). 2 Permessible of the German Drinking Water Ordinance (2001). 3 Control value for seepage of the German Federal Soil Protection Act an Ordinance (1999) according to § 8 1,2. 4 The aims of the system refer to average annual loads.

## Installation

## CAUTION! Important information, please observe.




## The following is to be checked before installation:

The filter must be installed with a so-called fall. This means that the incoming pipe (stormwater inlet) is led downwards just ahead of the shaft and can be connected to the lower connection as described.

The difference in invert between the incoming pipe and the outlet to discharge must be at least 250mm.


## HEAD OFFICE

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## DESIGN OFFICES

| | |
|---|---|
| New South Wales | 61 2 8838 1055 |
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| Queensland | 61 7 3277 5110 |
| Victoria & Tasmania | 61 3 5274 1336 |
| South Australia | 61 8 8275 8000 |
| West Australia | 61 8 9350 1000 |
| Northern Territory | 61 2 8838 1055 |
| New Zealand | 64 9 276 9045 |

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SPEL ENVIRONMENTAL
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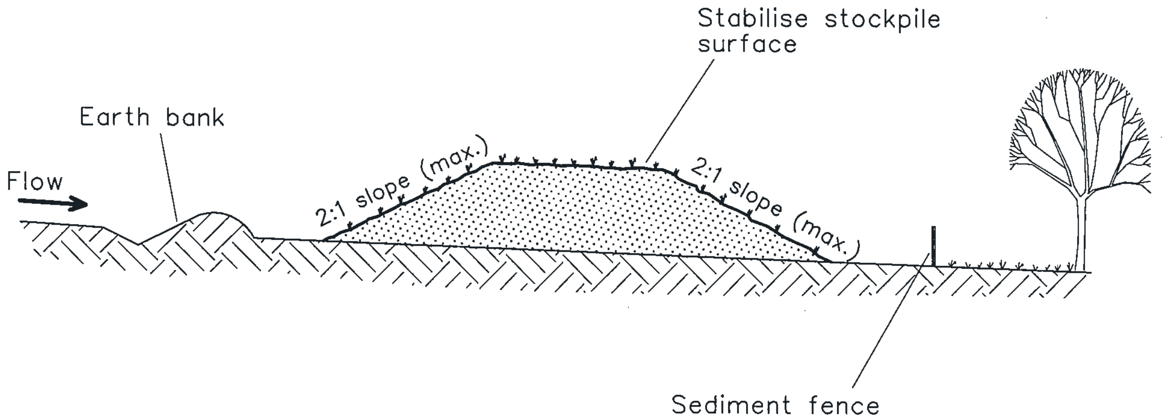
Annex D

# Standard Drawings



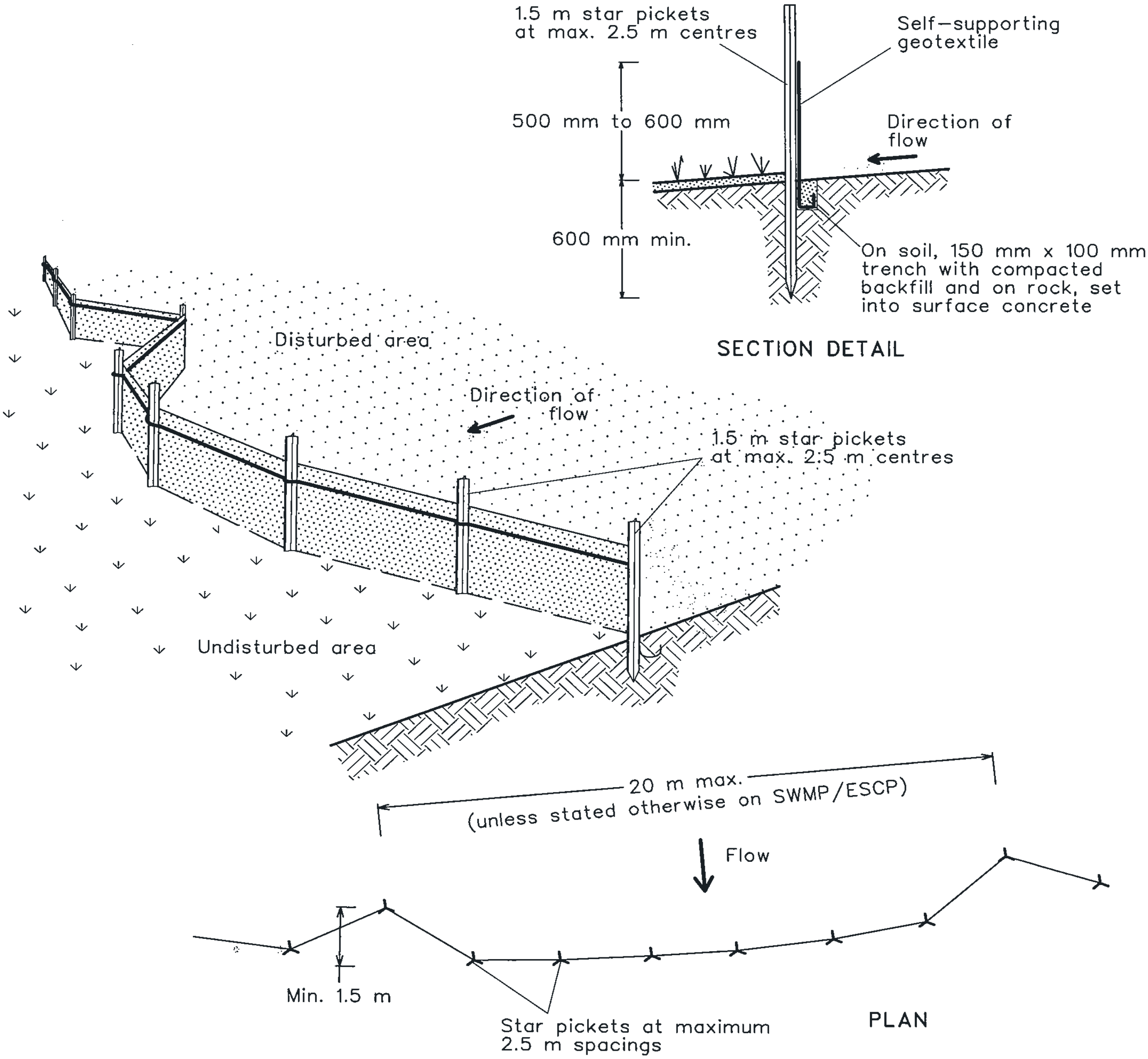

## Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

# STOCKPILES

SD 4-1

SOURCE: Managing Urban Stormwater, Soils and Construction (Vol 1, 4th ed.)




## Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.

2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.

3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.

4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.

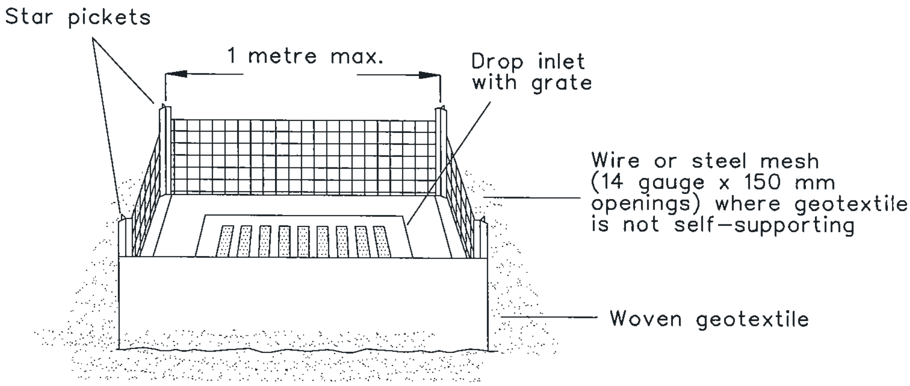
5. Join sections of fabric at a support post with a 150-mm overlap.

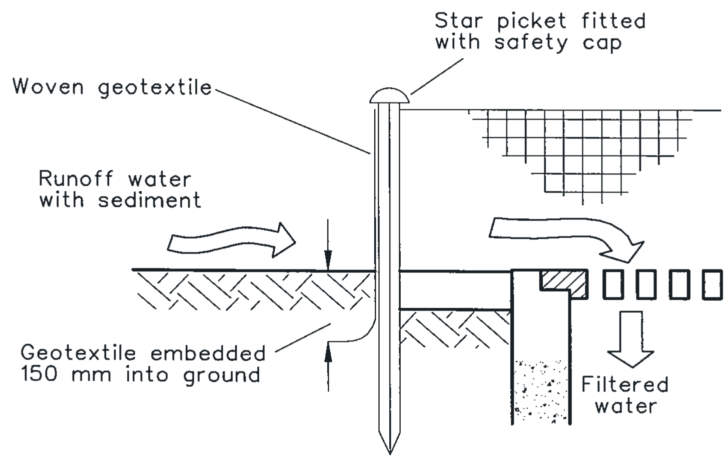
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

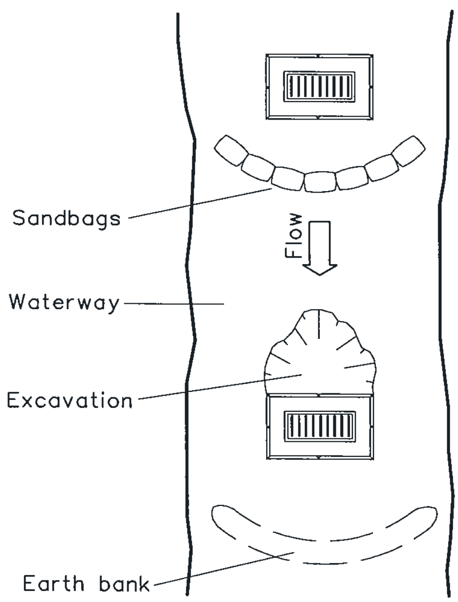
# SEDIMENT FENCE

**SD 6-8**

SOURCE: Managing Urban Stormwater, Soils and Construction (Vol 1, 4th ed.)




For drop inlets at non–sag points, sandbags, earth bank or excavation used to create artificial sag point

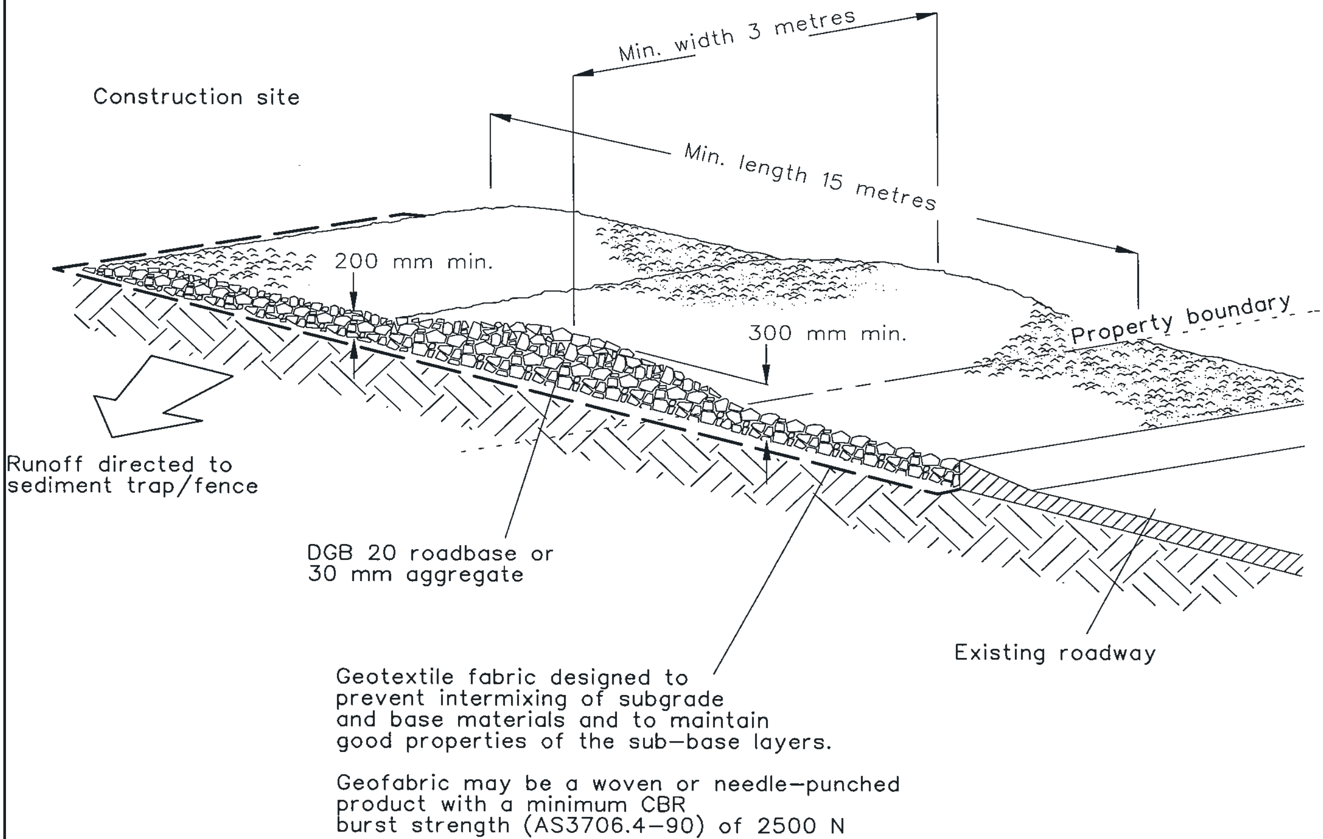
## Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

# GEOTEXTILE INLET FILTER

**SD 6-12**

SOURCE: Managing Urban Stormwater, Soils and Construction (Vol 1, 4th ed.)




## Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

## STABILISED SITE ACCESS — SD 6-14

SOURCE: Managing Urban Stormwater, Soils and Construction (Vol 1, 4th ed.)

## CONSTRUCTION

1. REFER TO APPROVED PLANS FOR LOCATION AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE FOUNDATION AREA OF THE OUTLET STRUCTURE (IF ANY), AND INSTALL AS PER SEPARATE INSTRUCTIONS.

3. EXCAVATE THE SETTLING POND IN ACCORDANCE WITH THE APPROVED PLANS. UNLESS OTHERWISE SPECIFIED, THE EXCAVATED PIT SHOULD HAVE A SIDE SLOPE OF 2:1(H:V) OR FLATTER.

4. APPROPRIATELY STABILISE ANY BANK SUBJECT TO DIRECT INFLOW.

5. ESTABLISH ALL NECESSARY UP-SLOPE DRAINAGE CONTROL MEASURES TO ENSURE THAT SEDIMENT-LADEN RUNOFF IS APPROPRIATELY DIRECTED INTO THE SEDIMENT TRAP.

6. TAKE ALL NECESSARY MEASURE TO MINIMISE THE SAFETY RISK CAUSED BY THE STRUCTURE.

## MAINTENANCE

1. CHECK EXCAVATED SEDIMENT TRAPS AFTER EACH RUNOFF EVENT AND MAKE REPAIRS IMMEDIATELY.

2. INSPECT THE BANKS FOR SLUMPING OR EXCESSIVE SCOUR.

3. IF FLOW THROUGH THE STRUCTURE IS REDUCED TO AN UNACCEPTABLE LEVEL DUE TO BLOCKAGE OF THE OUTLET STRUCTURE (IF ANY), THEN MAKE ALL NECESSARY REPAIRS AND MAINTENANCE TO RESTORE THE DESIRED FLOW CONDITIONS.

4. CHECK THE STRUCTURE AND SURROUNDING CHANNEL BANKS FOR DAMAGE FROM OVERTOPPING FLOWS AND MAKE REPAIRS AS NECESSARY.

5. REMOVE SEDIMENT AND RESTORE ORIGINAL SEDIMENT STORAGE VOLUME WHEN COLLECTED SEDIMENT EXCEEDS 30% OF THE PIT VOLUME.

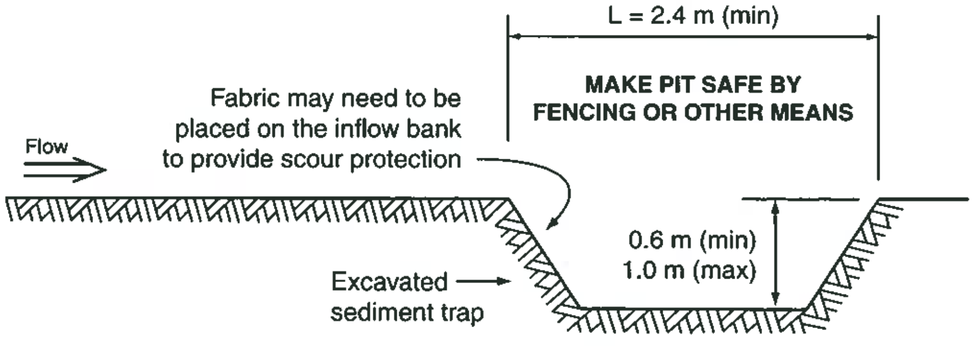
6. DISPOSE OF SEDIMENT AND DEBRIS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

## REMOVAL

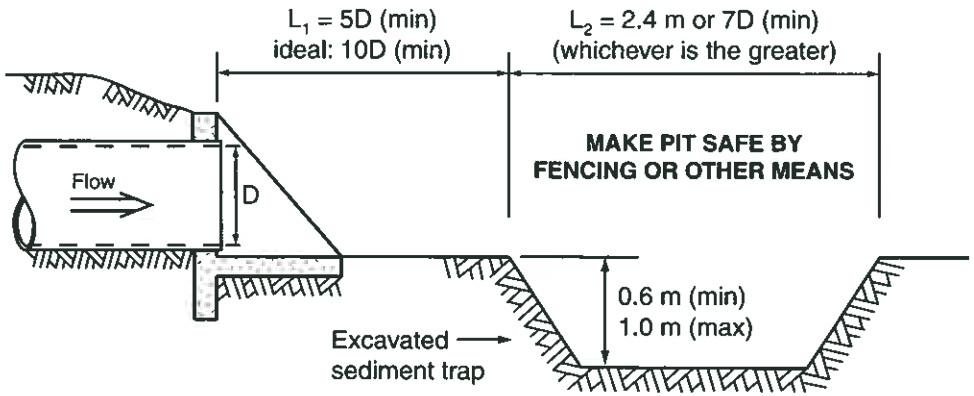
1. WHEN THE UP-SLOPE DRAINAGE AREA HAS BEEN STABILISED, REMOVE ALL MATERIALS INCLUDED DEPOSITED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

2. ALL WATER AND SEDIMENT SHOULD BE REMOVED FROM THE BASIN PRIOR TO THE DAM'S REMOVAL. DISPOSE OF SEDIMENT AND WATER IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. BRING THE DISTURBED AREA TO A PROPER GRADE, THEN SMOOTH, COMPACT AND STABILISE AND/OR REVEGETATE AS REQUIRED.




**(a) Excavated sediment trap located within a minor drainage path**




Where space is not available, make optimum use of the available space

**(b) Excavated sediment trap located downstream of a stormwater outlet**

| Drawn: | Date: | | |
|---|---|---|---|
| GMW | Apr-10 | Excavated Sediment Trap | EST-01 |

**INSTALLATION**

1. REFER TO APPROVED PLANS FOR LOCATION AND DIMENSIONAL DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION OF THE WASH BAY, REMOVING STUMPS, ROOTS AND OTHER VEGETATION TO PROVIDE A FIRM FOUNDATION. CLEAR SUFFICIENT WIDTH TO ALLOW PASSAGE OF LARGE VEHICLES, BUT CLEAR ONLY THAT NECESSARY FOR THE EXIT. DO NOT CLEAR ADJACENT AREAS UNTIL THE REQUIRED EROSION AND SEDIMENT CONTROL DEVICES ARE IN PLACE.

3. GRADE THE LOCATION OF THE WASH BAY SO THAT RUNOFF FROM THE UNIT WILL NOT FLOW INTO THE STREET, BUT WILL FLOW TOWARDS AN APPROPRIATE SEDIMENT-TRAPPING DEVICE.

4. PLACE AND COMPACT A 150mm THICK LAYER OF MINIMUM 50mm ROCK OVER THE ROADWAY BETWEEN THE WASH BAY AND THE SEALED STREET TO PREVENT TYRES FROM PICKING UP MORE SOIL AFTER THEY HAVE BEEN CLEANED.

5. FLARE THE END OF THE ATTACHED ROCK PAD WHERE IT MEETS THE PAVEMENT SO THAT THE WHEELS OF TURNING VEHICLES DO NOT TRAVEL OVER UNPROTECTED SOIL.

6. IF THE FOOTPATH IS OPEN TO PEDESTRIAN MOVEMENT, THEN COVER THE COARSE ROCK WITH FINE AGGREGATE OR GRAVEL, OR OTHERWISE TAKE WHATEVER MEASURES ARE NEEDED TO MAKE THE AREA SAFE.

7. IF A MECHANICAL VEHICLE-WASHING SYSTEM IS INSTALLED, PROVIDE A SUITABLE SOURCE OF POWER AND WATER SUPPLY.

8. IF THE VEHICLES ARE TO BE WASHED BY MANUAL HOSING, THEN ENSURE A HOSE (LONG ENOUGH TO REACH AROUND ANY VEHICLE LEAVING THE SITE) IS CONNECTED A SUITABLE PRESSURISED WATER SOURCE.

**MAINTENANCE**

1. INSPECT WASH BAYS PRIOR TO FORECAST RAIN, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF-PRODUCING RAINFALL, OR OTHERWISE AT FORTNIGHTLY INTERVALS.

2. IF SAND, SOIL, SEDIMENT OR MUD IS TRACKED OR WASHED ONTO THE ADJACENT SEALED ROADWAY, THEN SUCH MATERIAL MUST BE PHYSICALLY REMOVED, FIRST USING A SQUARE-EDGED SHOVEL, AND THEN A STIFF-BRISTLED BROOM, AND THEN BY A MECHANICAL VACUUM UNIT, IF AVAILABLE.

3. IF NECESSARY FOR SAFETY REASONS, THE ROADWAY SHALL ONLY BE WASHED CLEAN AFTER ALL REASONABLE EFFORTS HAVE BEEN TAKEN TO SHOVEL AND SWEEP THE MATERIAL FROM THE ROADWAY.

4. WHEN THE VOIDS BETWEEN THE ROCK BECOMES FILLED WITH MATERIAL AND THE EFFECTIVENESS OF THE ATTACHED ROCK PAD IS REDUCED TO A POINT WHERE SEDIMENT IS BEING TRACKED OFF THE SITE, A NEW 100mm LAYER OF ROCK MUST BE ADDED AND/OR THE ROCK PAD MUST BE EXTENDED.

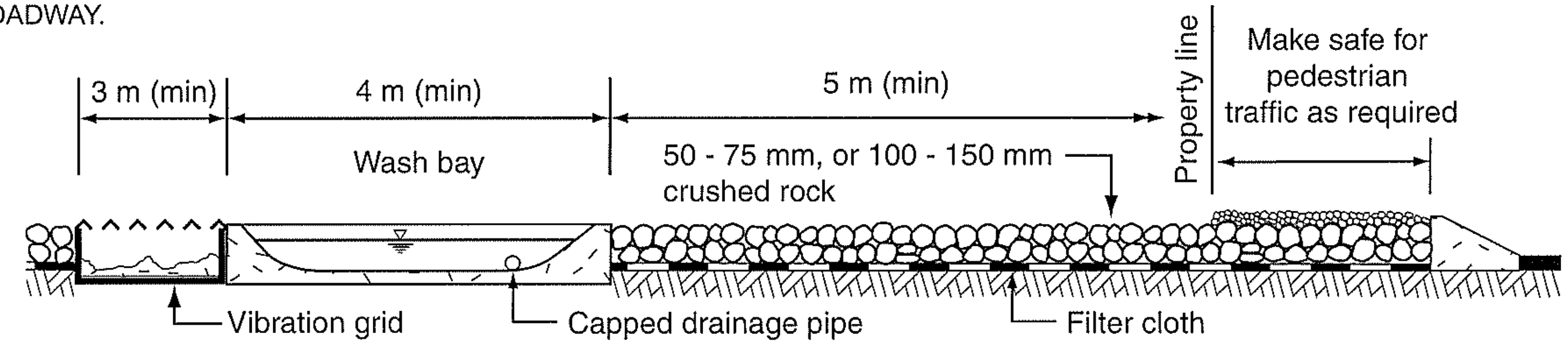
5. ENSURE ANY ASSOCIATED DRAINAGE CONTROL MEASURES ARE MAINTAINED IN ACCORDANCE WITH THEIR DESIRED OPERATIONAL CONDITION.

6. DISPOSE OF SEDIMENT AND DEBRIS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

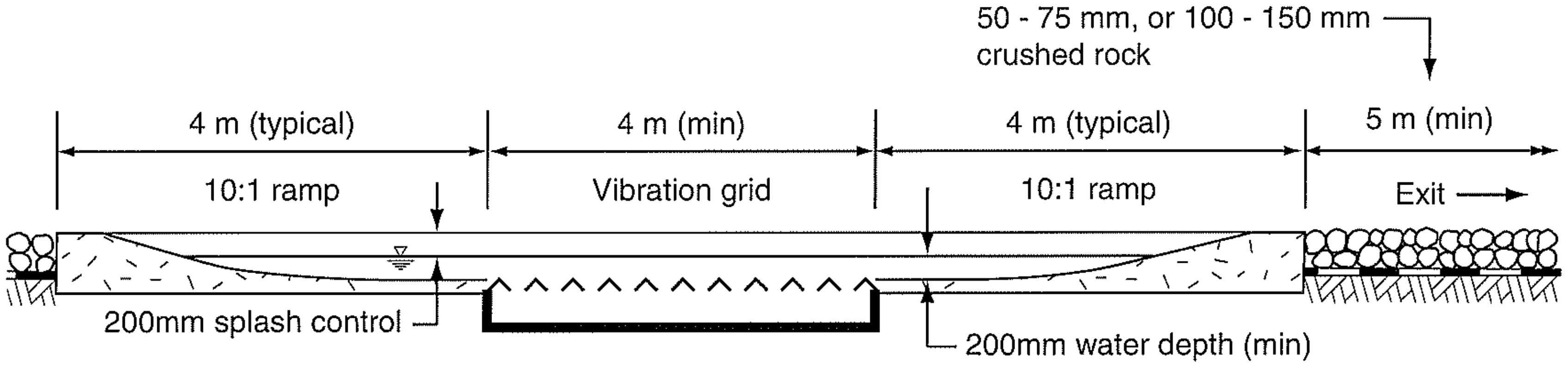
**REMOVAL**

1. THE WASH BAY SHOULD BE REMOVED ONLY AFTER IT IS NO LONGER NEEDED AS A SEDIMENT CONTROL DEVICE.

2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.
3. RE-GRADE AND STABILISE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.




**(a) Example of a low speed wash bay**




**(b) Example of a medium speed wash bay**

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