SLR HEGGIES
global environmental solutions

# 36-46 Gloucester Boulevarde

# Port Kembla

# Water Quality and Water Re-Use Assessment

Report Number 660.10047.00000 WQ

17 December 2010

TCG Planning
PO Box 848
Wollongong NSW 2520

Version: Revision 1

# 36-46 Gloucester Boulevarde

# Port Kembla

# Water Quality and Water Re-Use Assessment

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# 1 INTRODUCTION

## 1.1 Engagement

SLR Heggies Pty Ltd (Heggies) was commissioned by Ms Anna Grant of TCG Planning Pty Ltd on the 29 November 2010 (on behalf of Louis Mifsud '*the client*' of MCJC Industrial Pty Ltd) to conduct a Water Quality Assessment in relation to the proposed development at 36 – 46 Gloucester Boulevarde, Port Kembla, NSW 2505 (the site). This commission was based on the Heggies Offer of Services entitled *Environmental Assessments: DA Application 36 – 46 Gloucester Boulevarde, Port Kembla* (Ref. 660.10047 Offer of Services TCG Planning 20101019).

## 1.2 Scope of Works

This report assesses the potential impact of the proposed development on the stormwater characteristics of the site in terms of water quality and identifies potential stormwater management devices to either maintain or improve the quality of stormwater being discharged from the site post-development. This report also assesses potential options for water re-use with regards to the proposed operations onsite.

The assessment has been based on the requirements of the following documents:

- Wollongong City Council – Wollongong Development Control Plan 2009
- NSW EPA, Managing Urban Stormwater : Treatment Techniques 1997
- Department of Environment and Conservation NSW, Managing Urban Stormwater : Harvesting and Re-Use (2006)
- NSW Department of Housing, Managing Urban Stormwater : Soils and Construction (1998)

The scope of works included:

- Assessment of site characteristics including topography, ground conditions, downstream receptors and overland flow paths;
- Assessment of the potential increase in stormwater pollutants as a result of the development;
- Recommendations of treatment measures to mitigate the potential pollution increase; and
- Water re-use options appraisal.

The assessment has been based on the proposed drainage design drawing prepared by Sherson Lautier Consultancy for the Development Application.

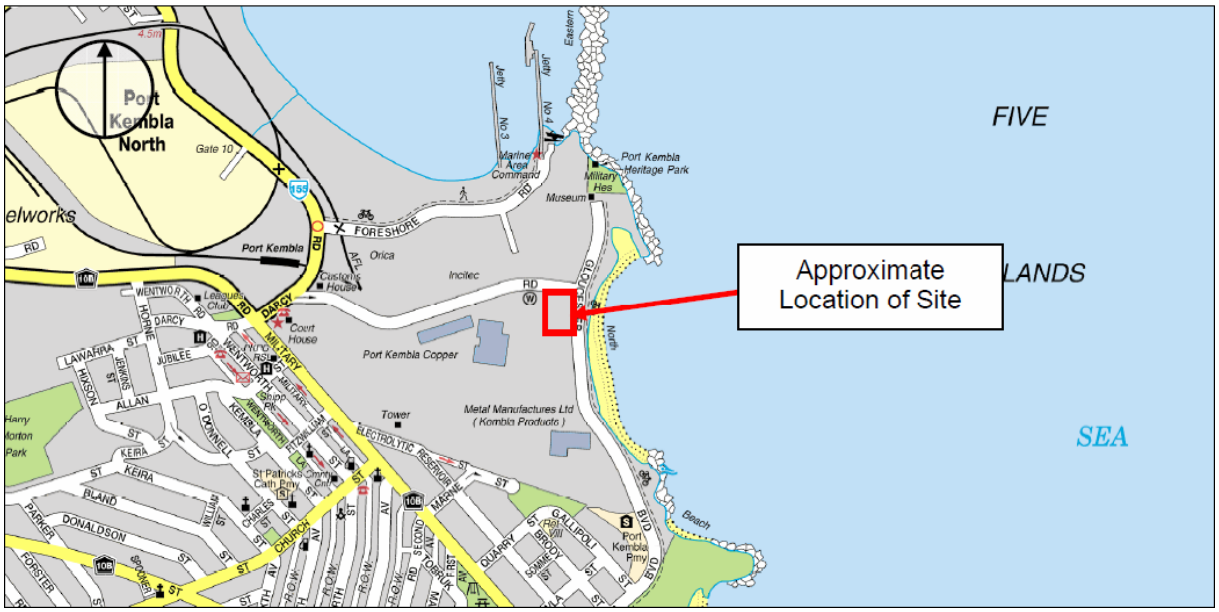
# 2 SITE IDENTIFICATION

The site is commonly referred to as 36 – 46 Gloucester Boulevarde, Port Kembla and consists of three (3) individual titled properties namely Lots 101, 102 and 103 in DP 839149. The total site covers an area of approximately 2.7ha with approximately 1.9ha proposed for redevelopment. The site location is presented in **Figure 1.** A detailed site plan showing the development area is located in **Appendix A.**

SLR Heggies personnel inspected the site on 26 October 2010. At the time of inspection the site was cleared and free from vegetation. The entire site was sealed with gravel/asphalt hardstand which in many places has become deteriorated and cracked. The site was relatively flat in terms of topography with some localised settlement likely to be associated with the unconsolidated nature of the on site subsoils. Three discrete small mounds of material where located in the centre area of the site and appeared consistent with past intrusive sampling. A drainage line with grated drains traverses the southern half of the site and is inferred to flow out on Metal Manufactures Beach some 20m to the east.

Generally the site is surrounded by heavy industry that has been historically established for more than 50 years. To the north of the site is Darcy Road followed by a large industrial premises currently occupied by Orrcon Steel (and previously occupied by HBL – a transport company). An electrical sub station (believed to be less than 10 years old) is located on the western boundary of the site (approximately 40m south of Darcy Road) followed by a number of industrial premises. Metal Manufactures (a metal manufacturing company) is located to the south of the site while Gloucester Boulevarde forms the eastern border of the site and is bordered by Metal Manufactures Beach.

**Figure 1 Site Location**

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## 2.1 Soil Landscape

The Soil Conservation Services of NSW Wollongong – Port Hacking 1:100,000 (1990) Sheet maps show that the site is classified as disturbed terrain. The soils in this area are classified as fill material, wastes and dredged materials overlaying natural subsoils and rock at depths of greater that 1m.

## 2.2 Hydrology

The surrounding environment has been developed for heavy industrial land uses. Due to the relatively flat surrounding topography it is deemed that minimal overland flow will progress onto site. The Pacific Ocean and Metal Manufactures Beach are located approximately 25m to the east of the site and represent the only environmental receptor likely to be impacted upon by the site. Given the close proximity of the adjacent water bodies it is inferred that groundwater heads in an easterly direction and it is possible that the sites hydrological process may be impacted upon by the ocean. No apparent on-site use of groundwater was observed during the site assessment. Recent intrusive sampling by Heggies personnel has confirmed these observations.

# 3 WATER QUALITY ASSESSMENT

## 3.1 Assessment and Objectives

This section will focus on the potential increase in stormwater pollutants as a result of the development and recommend treatment measures to mitigate the potential pollution increase. This assessment has harnessed the objectives set out in the Development Control Plan prepared by Wollongong Council and supports the implementation of Best Management Practices (BMP) to ensure that no adverse impacts occur directly from the proposed development.

The aim of the water quality assessment is to ensure the proposed development activities do not lead to an increase in the concentration of pollutants being discharged from the site.

Increases in nutrients can promote growth of aquatic plants, particularly algae which can lead to a reduction a light penetration of water, and causing oxygen levels of water to decrease. Increases in suspended solids can lead to high turbidity in downstream water bodies.

Increases in suspended solids (particularly sediment) leads to an increase in the concentration of nutrients being transported downstream as well as impacting of downstream water turbidity.

Oxygen-demanding materials can deplete levels of dissolved oxygen in the water leading to anaerobic conditions which can cause aquatic plants and other aquatic organisms to be adversely impacted.

Estimates of Pre and Post development pollutant load have been summarised in **Appendix B**. The manual method used to model the pollutant export has been adopted here due to the minor scope of this development. This method uses average values of concentrations rather than median concentrations, hence will provide conservative results, refer to **Table 1** for expected water quality concentrations pre-development, post-development (untreated). Refer to **Appendix B** for the full calculation.

**Table 1 Expected Water Quality Concentrations**

| Pollutant | Pre-Development concentration (mg/L) | Post-Development (untreated) concentration (mg/L) | Reduction Required (%) | Target concentration (mg/L) |
|---|---|---|---|---|
| Total Suspended Solids | 68.20 | 88.20 | 80 | 17.64 |
| Total Nitrogen | 1.32 | 1.55 | 40 | 0.92 |
| Total Phosphorus | 0.21 | 0.29 | 55 | 0.13 |

The analysis indicates an increase in the concentration of suspended solids, total nitrogen and total phosphorus post-development if untreated, due to changes in site activities in the operational phase. It is intended that stormwater treatment devices are installed to ensure that there is no reduction in stormwater quality post-development as a result of activities on the subject site.

The short and long term objectives include:

- Management strategies to minimise water pollution after development of the subject site;
- Specific controls to minimise erosion and control sediment loss from the subject site as a result of construction;
- A monitoring and maintenance program for the construction phase;
- Performance criteria to be achieved through implementation of documented controls;
- Actions to be taken in the event that performance parameters are exceeded; and

- Defined responsibilities for implementation.

Stormwater treatment objectives have been set in accordance with Wollongong Council's DCP Chapter E15 - Water Sensitive Urban Design" and the NSW EPA "Managing Urban Stormwater" Council Handbook 1997 (page 23 Treatment Objectives). The reduction targets are tabulated below in **Table 2**:

**Table 2 Pollutant Reduction Targets**

| Pollutant | Goal / Vision | Treatment Objective |
|---|---|---|
| ***Construction Phase*** | | |
| Suspended Solids (SS) | Suspended solids loads equal those which would have been exported from the equivalent pre-development catchment. | Maximum SS concentration of 50 mg/L for all 5 day rainfalls up to the 75 percentile depth. All practical measures to reduce pollution are to be taken beyond this event. |
| Other Pollutants | No export of toxicants (eg pesticides, petroleum products, construction chemicals) from the site. | Limit the application, generation and migration of toxic substances to the maximum extent practicable. |
| ***Post Construction Phase*** | | |
| Suspended Solids (SS) | Suspended solids loads equal to that which would have been exported from the equivalent forested catchment. | 80% reduction of the average annual load generated from the development without treatment |
| Total nitrogen | The load of nitrogen from the catchment that results in the attainment of the ambient water quality concentration objective. | 40% % reduction of the average annual load generated from the development without treatment |
| Total phosphorus | The load of phosphorus from the catchment that results in the attainment of the ambient water quality concentration objective. | 55% % reduction of the average annual load generated from the development without treatment |
| Litter | No anthropogenic litter in water bodies. Input of organic litter equal to that, which would have occurred from the equivalent pre-development catchment. | Retention of litter greater than 50 mm for flows up to 25% of the 1 year ARI peak flow. |
| Coarse sediment | Coarse sediment loads equal to those which would have been exported from the equivalent pre-development catchment. | Retention of sediment coarser than 0.125 mm for flows up to 25% of the 1 year ARI peak flow. |
| Oil and Grease (hydrocarbons) | No visible oil and grease (anthropogenic hydrocarbons) in water bodies. | In areas with concentrated hydrocarbon deposited, no visible oils for flows up to 25% of the 1 year ARI peak flow. |

## 3.2 Proposed Water Quality Treatment Measures

Water Sensitive Urban Design (WSUD) treatment measures can be grouped into three main categories:

- Primary treatment – Physical screening or rapid sedimentation techniques – gross pollutants and coarse sediments;
- Secondary Treatment – Finer particle sedimentation and filtration techniques – fine particles and attached pollutants; and
- Tertiary Treatment – Enhanced sedimentation and filtration, biological uptake, absorption onto sediments.

The main WSUD treatment measures which offer a high water quality treatment function can include:

- Gross Pollutant Traps / Litter Traps;
- Grassed and Vegetated Swales;
- Bio-Retention Systems;
- Sedimentation Basins;
- Constructed Wetlands; and
- Infiltration Measures.

### 3.2.1 Constraints

The proposed stormwater drainage design (refer to Appendix C) was reviewed with consideration to water quality requirements.

The SLR Heggies Preliminary (Limited) Site Assessment (December 2010) states that "on the basis of the site history review and site inspection it is considered that there is potential for soil contamination due to both past on site (and adjacent) heavy industry as well as the presence of undocumented imported fill on the site. The work performed included a site history study, walkover inspection and limited intrusive sampling and testing. With the exception of asbestos no exceedences of the adopted site assessment criteria where noted. However, to date only limited intrusive sampling has been completed within the site, as such Heggies cannot conclude that there are no 'hot spots' or further elevated areas of contamination within the site.

### 3.2.2 Construction Phase

In order to minimise the amount of sediment and contaminated water which leaves the construction site, the following measures are recommended in accordance with Wollongong Council's DCP Chapter E22: Soil Erosion and Sediment Control:

- A Sediment fence should be constructed parallel to the contours of the site. Sediment fences comprise geo-textile fabric connected to hardwood star pickets driven into the ground at a maximum of 2.5m intervals;
- Mesh and gravel inlet filter sediment traps are required to be provided in front of any stormwater drainage gutter inlet puts, in order to prevent coarse sediment entering the inlet pit during construction;
- A designated wash out area should be set aside for waste water generating activities. The wash out area should be located away from drainage lines and street gutters. All runoff from the wash out area should be upstream of a sediment fence which will intercept sediment;
- Stockpiles of sand and soil should be sheltered or covered with a plastic sheet to prevent rainfall from mobilising soils. Stockpiles of building materials should be located away from drainage lines to prevent potentially contaminated surface water runoff from being routed directly into gutters; and
- Erosion and sediment control measures should be inspected and maintained in accordance with Section 5 of Wollongong Council DCP Ch E22.

### 3.2.3 Post-Construction Phase

The viability of various alternative water quality devices were investigated in addition to those incorporated within the drainage design (refer to **Appendix C**).

Due to the evidence provided within the SLR Heggies Preliminary (Limited) Site Assessment the underlying soils are deemed to be potentially contaminated, the precautionary principle has been adopted when considering the options for stormwater quality improvement devices. In order to prevent the mobilisation of pollutants the wide spread use of infiltration systems, bio-retention systems and grassed and vegetated swales for water quality treatment is deemed inappropriate. Due to the relatively minor surface water catchment area and limited space available constructed wetlands and sedimentation basins are also not deemed to be appropriate.

With consideration to the potential site constraints and underlying soil conditions, the proposed Gross Pollutant Traps incorporated within the drainage design (refer to Appendix C) are deemed to be an appropriate form of water quality treatment. A GPT is a sediment trap incorporating a litter or trash screening device. GPTs generally remove coarse litter and sediment greater than 5 millimetres. Some GPTs also offer coarse sediment (5mm to 0.5mm) and medium sediment (0.5mm to 0.062mm) reduction qualities as well as hydrocarbon, oil and grease reduction, phosphorus reduction and heavy metal reduction. Different GPTs (eg. a gravity pit system or vortex motion system) employ different methods of sediment and litter trapping, separation and containment. Regular maintenance of the GPT structure is required and involves the removal of litter and debris as well as the removal of collected coarse sediment.

The drainage design proposes to route surface water runoff generated from the building roof, car-parking and other hard-standing areas to one of two underground GPTs as shown in Drawing 10100-C2 (refer to **Appendix C**). One is located in the south-west corner of the site, the other in the north-east. Due to the relatively high water quality standard of roofwater runoff it is considered unnecessary in terms of water quality requirements to route roofwater runoff through the proposed GPTs. Roofwater is suitable for direct offsite disposal or water re-use as discussed in Section 4..

At this stage no detailed specification has been provided for the proposed GPT to be used. Therefore anticipated pollutant removal (trapping efficiency) expected from a Gross Pollutant Trap has been obtained from Section 4.4 of Managing Urban Stormwater (MUS): Treatment Techniques and is provided in **Table 3** below.

**Table 3 GPT Trapping Efficiency**

| Pollutant | Trapping Efficiency | Trapping Efficiency Range (%) | Average Trapping Efficiency (%) |
|---|---|---|---|
| Litter | Low | 10 -50 | 30 |
| Oxygen demanding material | Low | 10 -50 | 30 |
| Sediment | Medium to High | 50 – 100 | 75 |
| Oil and Grease | Negligible | 0 | 0 |
| Nutrients | Low | 10 – 50 | 30 |
| Bacteria | Low | 10 - 50 | 30 |

**Table 4** compares the expected post-treatment concentrations of TSS, TN and TP (applying the average trapping efficiency for a GPT as set out in **Table 3**) to the target concentrations set out in **Table 1**.

**Table 4 GPT Treatment Analysis Results**

| Pollutant | Pre-Development concentration (mg/L) | Post-Development (untreated) concentration (mg/L) | Target Reduction (%) | Target Concentration (mg/L) | GPT Trapping Efficiency | Post-treatment concentration (mg/L) |
|---|---|---|---|---|---|---|
| Total Suspended Solids | 68.20 | 88.20 | 80 | 17.64 | 75 | 22.05 |
| Total Nitrogen | 1.32 | 1.55 | 40 | 0.93 | 30 | 1.09 |
| Total Phosphorus | 0.21 | 0.29 | 55 | 0.13 | 30 | 0.20 |

The use of GPTs alone does not meet the Wollongong Council WSUD target concentrations for pollutant removal. However, the majority of TSS will be removed from stormwater as well as a minor decrease below the pre-development concentration for TN and TP.

Although the post-treatment concentrations of TSS, TN and TP are slightly higher than the target WSUD concentrations, it is considered the quality of water being discharged from the site post-development will be higher than that of the water being discharged predevelopment, therefore no detrimental impact will be caused to the downstream environment.

It is also considered that due to the minor catchment area of the site and due to stormwater being discharged either onto the Metal Manufactures beach or to a stone walled watercourse and ultimately the Pacific Ocean a short distance downstream, the nutrient concentration and suspended solids concentration is likely to cause a negligible impact to the downstream environment given the high dilution which will occur on contact with the ocean.

Vegetated landscape areas located along the site boundaries adjacent to Gloucester Boulevarde and Darcy Road are likely to provide a grass buffer zone to provide some trapping value for suspended solids within surface water runoff during rainfall events which exceed the drainage design criteria.

# 4 WATER RE-USE ASSESSMENT

## 4.1 Potential Options

Vesuvius were approached to discuss the future site operations and potential water re-use options, including the use of rainwater and recycled process water for operations onsite which require a water supply.

The primary use of process water onsite is for washdown of the mixers. Powders, gravels and alike will be mixed within the mixers to make to make cement and other substances. Periodical washdown of the mixers and their surrounds is required to remove sediment, dust and other debris. It is understood that approximately 400 L/day of water will be used for washdown purposes. Potable quality water is not required for washdown, therefore either rainwater (harvested from the roof) or potentially recycled washdown water with some pre-treatment could be used to supply washdown water. Washdown water would need to be treated primarily to remove suspended solids prior to re-use.

## 4.2 Potential Water Re-Use Scheme

Given the large roof area available (approx. 8026m$^2$) and the relatively clean nature of surface water runoff generated on a roof, it is deemed appropriate that roof runoff could be collected and stored in rainwater storage tank(s) as a source of supply for washdown water..

For example if 2mm of rainfall fell on 8000m$^2$ of roof then approximately 20m$^3$ of water could potentially be harvested. This would supply washdown water alone for 40 days. According to the Bureau of Meteorology (BOM) website Port Kembla receives an average of 1250mm of rainfall per year, thereby providing adequate rainfall supply (providing enough storage capacity is provided).

In order to re-use washdown water, the waste water stream would need to be treated via some form of sediment trap or filtration system prior to being routed to a storage tank ready for re-use. The treatment system would incur additional maintenance costs and require regular inspections. Therefore a rainwater harvesting system is deemed to be preferable.

The system would also need to be connected to the main water supply, as a supplementary supply during dry periods when rainwater harvesting does not supply sufficient volume of water for washdown.

### 4.3 Further Feasibility Assessment

The potential option to implement rainwater harvesting facilities requires further work at the construction certificate stage of the project to ascertain full system requirements and to allow to adequately size the roofwater harvesting, storage and distribution system in order to understand all supply requirements and the feasibility of including such a system.

## 5 CONCLUSIONS AND RECOMMENDATIONS

An assessment has been undertaken to assess the anticipated stormwater quality during the construction and operational phases of the project.

Two Gross Pollutant Traps (GPTs) are to be provided onsite to provide water quality treatment. It is recommended that the GPT locations are positioned to ensure the maximum volume of surface water runoff generated from the site is treated prior to offsite discharge. It is recommended that surface water runoff generated from hardstanding areas is routed to one of two GPTs for treatment prior to offsite disposal to Metal Manufactures beach and a stone lined watercourse, ultimately discharging to the Pacific Ocean. However, roof runoff is deemed suitable for direct offsite disposal.

Further more, an initial assessment has been undertaken to assess options for the re-use of water for the project. Based on the understanding of the site's water requirements during the operational phase, it is recommended that a further detailed assessment be undertaken at the construction certificate stage to ascertain the feasibility of implementing a rainwater harvesting system to collect and harness roof runoff for washdown water.

## 6 REFERENCES

Wollongong City Council – *Wollongong Development Control Plan* 2009

New South Wales Environment Planning Authority, *Managing Urban Stormwater : Treatment Techniques (1997)*

Department of Environment and Conservation New South Wales, *Managing Urban Stormwater : Harvesting and Re-Use (2006)*

New South Wales Department of Housing, *Managing Urban Stormwater : Soils and Construction (1998)*

SLR Heggies Preliminary (Limited) Site Assessment 36 – 46 Gloucester Boulevarde, Port Kembla (December 2010)

## 7 CLOSURE

This report has been prepared by Heggies Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of TCG Planning. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Heggies.

Heggies disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

**DETAILED SITE PLAN**

**POLLUTANT LOAD CALCULATION**

**Project:** **36-46 Gloucester Boulevarde, Port Kembla**

## Pollution Loading

**Estimation of Pollutant/Runoff Loads**

(Based on, "Guidelines for Pollutant Export Modelling in Brisbane", Brisbane City Council, 2000 and Woolongong DCP, 2009 - WSUD Stormwater Quality Performance Targets)

**Effect of Carpark On Pollution Loads**

| Input | Enter | Post D Area (ha) | Pre D Area (ha) |
|---|---|---|---|
| Forest/ Vegetated Open Space | | 0 | 0 |
| Rural | | 0 | 0 |
| Urban | | 0 | 0 |
| Commercial | | 0 | 0 |
| Industrial | | 1.7937 | 2.7 |
| Roof/Road | | 0.9063 | 0 |
| Total | | 2.7 | 2.7000 |

| Post Development Pollutant Concentrations (mg/L) | SS | TN | TP |
|---|---|---|---|
| | 88.200 | 1.548 | 0.293 |
| Target | 17.640 | 0.929 | 0.132 |

| Pre Development Pollutant Concentrations (mg/L) | SS | TN | TP |
|---|---|---|---|
| | 68.201 | 1.323 | 0.212 |

**Enter Average Rainfall** 1.206 **m/yr**

| Runoff Volume | | Post Flows | Pre | | Runoff Coeficients |
|---|---|---|---|---|---|
| Forest… | | 0 | 0 | Forest… | 0.15 |
| Rural | | 0 | 0 | Rural | 0.24 |
| Urban | | 0 | 0 | Urban | 0.38 |
| Commercial | | 0 | 0 | Commercial | 0.57 |
| Industrial | | 12330.25 | 26049.6 | Industrial | 0.57 |
| Roof/Road | | 9836.98 | 0 | Roof/Road | 0.9 |
| | Total | 22167.2 | 26049.6 | m^3/yr | |

(0.9 runnof coefficient was applied to the pre-development concentrations for industrial due to the amount of hardstanding area onsite)

**Pollutant Loads**

**Average Annual Load (kg/yr)**

| | SS | TN | TP | SS | TN | TP |
|---|---|---|---|---|---|---|
| Forest… | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Rural | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Urban | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Commercial | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Industrial | 1180.255 | 22.888 | 3.675 | 1776.600 | 34.452 | 5.532 |
| Roof/Road | 774.887 | 11.438 | 2.820 | 0.000 | 0.000 | 0.000 |
| Total | 1955.141 | 34.325 | 6.496 | 1776.600 | 34.452 | 5.532 |

**Ave Loads (kg/ha/yr)**

| | SS | TN | TP |
|---|---|---|---|
| Forest… | 27 | 0.89 | 0.038 |
| Rural | 107 | 5.66 | 0.698 |
| Urban | 471 | 8.56 | 1.203 |
| Commercial | 855 | 12.62 | 3.112 |
| Industrial | 658 | 12.76 | 2.049 |
| Roof/Road | 855 | 12.62 | 3.112 |

**SHERSON LAUTIER DRAWING 10100-C2 SCHEMATIC STORM WATER LAYOUT**

DIMENSIONS IN MILLIMETRES DO NOT SCALE



| | AMENDMENT NOTE | | DATE |
|---|---|---|---|
| A | | | |

A B C D E F G H J K L M N P Q R S T U

6800 TYP.

EXISTING MM KEMBLA GATE VALVE PIT WITH 900Ø PIPE DISCHARGING INTO LOT 102 TO REMAIN. AS IS 900Ø PIPE IN LOT 102

NOTE THE PROVISION OF THIS EASEMENT INCUDING ITS LOCATION IS SUBJECT TO AGGREEMENT OF BOTH BURDENED PROPERTY OWNERS

EXISTING MM KEMBLA GATE VALVE PIT WITH 900Ø PIPE DISCHARGE REDUCED TO 450Ø IN LOT 102 + ADDITIONAL HIGH LEVEL 300Ø PIPE

NOTE ADJACENT CROSSFALL TO KERB AND GUTTER FORMS OVERFLOW PATH NORTH TO DARCY ROAD FROM MM KEMBLA SITE GATE VALVE PITS ARE CLOSED

1B

1A

IBC STORAGE (BUNDED)

SODIUM ALUMINATE (BUNDED)

RESIN 1781 (BUNDED)

LPG WASTE GEN WASTE

INTEGRAL ENERGY SUB STATION

EXISTING 450Ø RCP TO REMAIN

3750 RIBLOC 1% 3750Ø RIBLOC 1% 3750Ø RIBLOC 1% 3000Ø RIBLOC 1% 3000Ø RIBLOC 1%

2250Ø RIBLOC

CLAY FOR BAY

GUNNING TRIAL BOX

CONSTRUCT NEW PIT OVER EXISTING CONC PIPE AND MAKE GOOD

4500Ø RIBLOC OR RCP 1.5%

EXIST 900 RCP TO REMAIN

NOTE CREATE EASEMENT TO DRAIN WATER 1.20M. WIDE IN FAVOUR OF LOTS AS PER ORIGINAL EASEMENT AND DEPOSITED PLAN.

REMOVE CONCRETE SURROUND RISER AND DROP PIT LEVEL TO R.L. 6.600 AS SHOWN

109.65

GPT 1

3600Ø RIBLOC 1.5%

300Ø RIBLOC 1% 225Ø UPVC 1% 150Ø UPVC 1% 150Ø UPVC 1% 225Ø UPVC 1% 300Ø RIBLOC 1%

DIESEL

PALLET STORAGE

DROOF 10 =110L/S 3600Ø RIBLOC 1.5% FALL

NOTE CREATE EASEMENT TO DRAIN WATER 1,20M. WIDE IN FAVOUR OF LOTS AS PER ORIGINAL EASEMENT AND DEPOSITED PLAN.

REMOVE CONCRETE SURROUND RISER AND DROP PIT LEVEL TO SUIT NEW PAVEMENT RLS AS NECESSARY

PROPOSED BUILDING F.F.L. 6.800

PRODUCTION AREA

102 1.034 ha

101 8031m²

6m HIGH SL / DR

6m HIGH WALL

EXISTING EASEMENT IS TO BE EXTINGUISHED AND MADE REDUNDANT. NOTE NO PIPEWORK IS PRESENT IN EASEMENT

CRUSHER

3000Ø RIBLOC 1.5% FALL Q=210L/S

3750Ø RIBLOC 1.5% FALL Q=225L/S

DARCY ROAD

NOTE CREATE EASEMENT TO DRAIN WATER 1,20M. WIDE IN FAVOUR OF LOTS AS PER ORIGINAL EASEMENT AND DEPOSITED PLAN.

PROVIDE PILING AND OR PIERING OF NEW BUILDING AS SPEC. BY THE STRUCTURAL ENGINEER ADJACENT TO THE EXISTING EASEMENT.SUBJECT TO EXACT LOCATION OF PIPE.

OVERFLOW PATH TO DRIVEWAY

GRADE 1:34

GRADE 1:20

GRADE 1:20

CRIB ROOM

FEMALE AMENITIES

TRAINING & INDUCTION ROOM

MALE AMENITIES

FIRST AID

Female

Male

Recep.

MEETING RM

MEETING RM

PURCHASING MANAGER

ACCOUNTS PAYABLE / RECEIVABLE

ACCOUNTANTS

LAB OFFICE

LAB OFFICE

LAB AREA

PHYSICAL TESTING

HEAT TREATMENT

SAMPLE PREPARATION

300Ø RIBLOC Q10 = 110 L/S 1.5%

300Ø RIBLOC Q10 =110L/S

150Ø UPVC 1.5% Q10 = 20L/S.

150Ø UPVC 1%

150Ø UPVC 1% Q10=15L/S.

300Ø RIBLOC 1%

225Ø RIBLOC 1%

300Ø RIBLOC 1%

GPT 2

DARCY

EXISTING 450Ø RCP TO REMAIN APPROX. CAPACITY = 360L/S.

EXISTING 375Ø RCP FROM KIP TO BE EXCAVATED TO PROPERTY LINE AND EXTENT AND INTEGRITY DETERMINED REPLACE WITH 450Ø WHERE NECESSARY

EXISTING KIP TO REMAIN

EXISTING 600Ø RCP TO REMAIN CAPACITY = 870L/S.

www.dialbeforyoudig.com.au DIAL 1100 BEFORE YOU DIG

BREAK INTO EXIST. LINE &MAKE GOOD

300Ø RIBLOC

EX 150Ø

EX 900Ø

EX 900Ø

TRANSFORMER

EMERGENCY OVERFLOW TO GLOUCESTER BOULEVARDE

EMERGENCY OVERFLOW TO GLOUCESTER BOULEVARDE

EMERGENCY OVERFLOW TO GLOUCESTER BOULEVARDE

GLOUCESTER BOULEVARDE

BEACH

EXISTING CAPACITY OF 900Ø RCP @ 1.2% FALL = 2.5 CUMECS

TOTAL COMBINED

NOTE OSD DESIGN IS IN ACCORDANCE WITH WOLLONGONG CITY COUNCILS ON-SITE STORMWATER DETENTION CODE JUNE 2006

NOTE ALL BOX GUTTERS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH AS/NZ 3500.3:2003 WITH FULL WIDTH OVERFLOWS AT ENDS

NOTE ALL REDUCED LEVELS ARE TO AHD AUSTRALIAN HEIGHT DATUM

NOTE EXACT R.L.S. OF UNDERGROUND UTILITIES ARE UNABLE TO BE VERIFIED DUE TO VARIABLE DEPTHS AND UNAVAILIBILITY OF WAX INFORMATION. ALL ABOVE GROUND SERVICE ACCESS POINTS HAVE BEEN LOCATED ON THE SURVEY PLAN.

## SCHEMATIC STORM WATER LAYOUT

SCALE 1:100

NOTE EXISTING SURFACE LEVELS SHOWN THUS 8.66

DESIGN SURFACE LEVELS SHOWN THUS +10.100

UNLESS SHOWN OR NOTED OTHERWISE ALL AG. P.V.C. DRAINS TO BE 100 DIA. 1% MIN. FALL TO STORM WATER LINES OR PITS

ALL AG DRAINS ARE TO HAVE FILTER SOCKS PROVIDED AS PER MANUFACTURERS SPECIFICATIONS AND REQUIREMENTS

### LEGEND

- FLUSH MOUNTED SURFACE GRATE AS SPECIFIED TO ACCOMODATE 100 Ø OUTLET MIN.
- OUTLET POINT IN LANDSCAPE AREAS TO SUIT ATLANTIS DRAINAGE CELL
- GRATED PIT PLAN HEAVY DUTY GALV. METAL GRATE
- BEAM PENETRATION FOR PIPEWORK (bp)
- CONCRETE COVERED PIT
- STORM TECH DRAIN



PROPOSED INDUSTRIAL BUILDING
LOT 101, 102 & 103 DP 839149
CNR DARCY RD AND GLOUCESTER BVDE
PORT KEMBLA
FOR: WAREHOUSE KING

SCHEMATIC STORM WATER LAYOUT

DATE 20-7-2010
DRAWN MDM
CHECKED
ENGINEER
SCALES 1:300 @ A1 1:200 @ A3

SHERSON LAUTIER CONSULTANCY PTY. LTD.
CONSULTING ENGINEERS email: sherson@1earth.net
16 BELMORE STREET WOLLONGONG NSW 2500
A.C.N. 093 756 328 A.B.N. 51 093 756 328
Phone. 42 285122 Fax. 42 291572

DRAWING No. 10100-C2
No. OF SHEETS 4

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