



Stormwater Management Plan



Cowes Bay Group Pty Ltd
Proposed Warehouse Development
35-65 Paramount Road,
Tottenham Victoria 3012.

17th October 2022

Ref 22/170

Revision D

STORMWATER MANAGEMENT PLAN

Proposed Warehouse Development **35-65 Paramount Road** **Tottenham Victoria 3012.**

1.0 INTRODUCTION

Cowes Bay Group Pty Ltd is proposing to construct a warehouse development and associated concrete hardstand areas at 65-65 Paramount Road, Tottenham, Victoria. This site has an existing warehouse, offices and carparking, with the warehouse development to be added. Refer the area shaded blue in Figure 1.

1.1 Scope

Davis Naismith and McGovern have been commissioned by Cowes Bay Group to provide conceptual civil design and storm water management plan for the above mentioned site as required for the development application.

1.2 Local Regulatory Authority

The City of Maribyrnong is the local regulatory authority with jurisdiction over stormwater. This report details how the proposed development complies with Clause 53.18 – Stormwater Management in Urban Design, amendment VC154 of the Victoria Planning Provisions and Maribyrnong City Council relevant requirements.

Clause 53.18-5 Stormwater Management

This clause details the management objectives and standards for the proposed stormwater system. A summary of objectives includes retention and reuse of stormwater, reducing the impact on the stormwater system, filtration of sediment and waste from stormwater, contribute to cooling, contribute to local habitat, provision of attractive spaces and ensure industrial and chemical pollutants do not enter the stormwater system.

Standard W2 of this clause states that stormwater management systems should be designed to:

- Meet the current best practice performance objectives for stormwater quality as contained in the Urban Stormwater - Best Practice Environmental Management Guidelines (Victorian Stormwater Committee, 1999).
- Minimise the impact of chemical pollutants and other toxicants including by, but not limited to, bunding and covering or roofing of storage, loading and work areas.
- Contribute to cooling, improving local habitat and providing attractive and enjoyable spaces.

1.3 Existing Infrastructure

There are legal points of discharge servicing the development, thus dividing the stormwater to Western and Eastern sites. The Western site is currently used as a freight and logistics facility and offices with associated concrete hardstand and carparking areas. The two discharge locations consist of the council stormwater drain in Olympia Street at the south

west corner of the property, and an outfall drain to Stoney Creek at the south east of the site, as shown in Figure 1. Refer Appendix A for legal point of discharge documentation.



Figure 1 Existing Site Aerial Photo

2.0 PROPOSED ON SITE WORKS

This SWMP covers only the shaded section of the site as per the Figure 1.

2.1 Minor System (onsite)

The existing onsite in ground piped stormwater system will be retained and a new in ground piped stormwater system for the proposed works will be designed for a 1 in 10 year ARI storm event as per City of Maribyrnong and NCC requirements. This system has been designed using the rational method of stormwater analysis. Refer Figure 2 for the IFD Curve.

2.2 Major System (onsite)

The onsite overland flow stormwater system will be designed for a 1 in 100 year ARI storm event as per City of Maribyrnong and NCC requirements. This system has been designed using the rational method of stormwater analysis.

2.3 Stormwater Detention (onsite)

On-site stormwater detention is to be provided as per the requirements of the City of Maribyrnong.

Detention volume required for East Site: 365m³

Detention volume required for West Site: 252m³

Refer to Appendix B for computations.

2.4 Legal Point of Stormwater Discharge

Currently the site has two discharge locations, the council stormwater drain in Olympia Street at the south west corner of the property, and an outfall drain to Stoney Creek at the south east of the site, as shown in Figure 1.

This has been confirmed by City of Maribyrnong. Refer Appendix A for legal point of discharge documentation.

3.0 WATER QUALITY

It is proposed to provide for water quality improvements on site and to treat gross pollutants and nutrients to meet the requirements of the *Urban Stormwater – Best Practice Environmental Management Guidelines*. MUSIC modelling has been used to analyse the systems efficiency.

Water Quality Best Practice Targets.

- Gross Pollutants : 70% reduction of the post development mean annual load of gross pollutant (greater than 5mm)
- Total Suspended Solids : 80% reduction of the post development mean annual load of Total Suspended Solids
- Total Phosphorus : 45% reduction of the post development mean annual load of Total Phosphorous.
- Total Nitrogen : 45% reduction of the post development mean annual load of Total Nitrogen.

3.1 Treatment System

For the Western site, encompassing Warehouses A and D, the proposed treatment system will be as detailed below or approved equivalent.

- 30kL rainwater tanks will be installed for each warehouse (2 no) to capture stormwater from the half of the roof surfaces and store it for toilet flushing and irrigation, effectively reducing the actual volume of water leaving the site.
- A SPEL Ecoceptor (6000 series) to be used at the end of the stormwater system discharging to the legal point of discharge for this site.
- A SPEL: Hydrosystem (HS 1500/4) to be used in tandem with the SPEL Ecoceptor prior to discharge for this site.

The MUSIC treatment train efficiency and layout for the West site is as shown below in Figure 3 & 4 respectively.

For the Eastern site, encompassing Warehouses B1 and B2 and Buildings C1, C2 and C3, the proposed treatment system will be as detailed below or approved equivalent.

- 30kL rainwater tanks will be installed for each warehouse and Building C2 (3 no) to capture stormwater from half of the roof surfaces and store it for toilet flushing and irrigation, effectively reducing the actual volume of water leaving the site.
- SPEL Stormsacks are to be used in each carpark. Stormsacks to be installed in 3 of the pits for the B1 carpark, 4 of the pits in the B2 carpark, 2 of the pits in the C1 carpark and 1 of the pits in the C2 carpark (10 Stormsacks total).
- A SPEL Ecoceptor (6000 series) to be used at the end of the stormwater system discharging to the legal point of discharge for this site.
- A SPEL: Hydrosystem (HS 1500/4) to be used in tandem with the SPEL Ecoceptor prior to discharge for this site.

The MUSIC treatment train efficiency and layout for the East site is as shown below in Figure 5 & 6 respectively.

3.2 Stormwater Reuse

It is proposed to use water from the roof runoff, supplemented with mains water, for sufficient potable water to the development site.

For the Western site, 2 x 30,000 litre rainwater tanks will be provided to store water from half of the roof area of each warehouse.

For the Eastern site, 3 x 30,000 litre rainwater tanks will be provided to store water from half of the roof area of each warehouse and building C2.

4.0 MAINTENANCE

The stormwater system, including the water quality elements, shall be maintained in accordance with the operation maintenance manual and/or the manufacturer's requirements whichever is more rigorous.

5.0 DISCHARGE

The City of Maribyrnong has advised the Legal Points of Discharge for stormwater for the site is the council stormwater drain in Olympia Street at the south west corner of the property, and an outfall drain to Stoney Creek at the south east of the site. Refer Appendix A for legal point of discharge documentation.

Yours faithfully,

DAVIS, NAISMITH & McGOVERN PTY.LTD.



Adam Bethune
Director

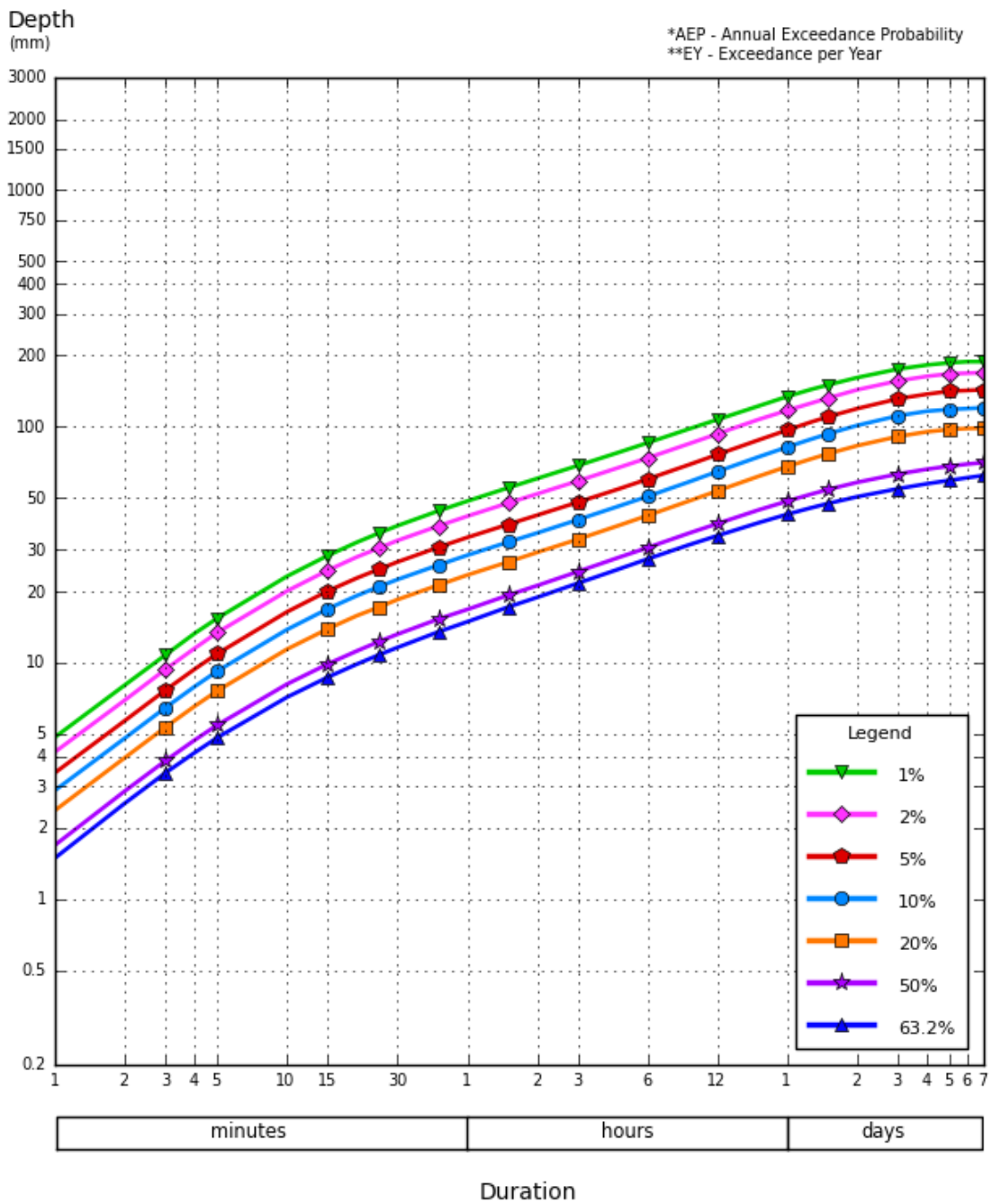


Figure 2 Bureau of Meteorology IFD Curve

Treatment Train Effectiveness - Receiving Node			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	17.6	16.9	3.8
Total Suspended Solids (kg/yr)	2560	481	81.2
Total Phosphorus (kg/yr)	5.47	1.5	72.5
Total Nitrogen (kg/yr)	40.1	18.3	54.2
Gross Pollutants (kg/yr)	648	6.57	99

Figure 3 Treatment Train Effectiveness – West site

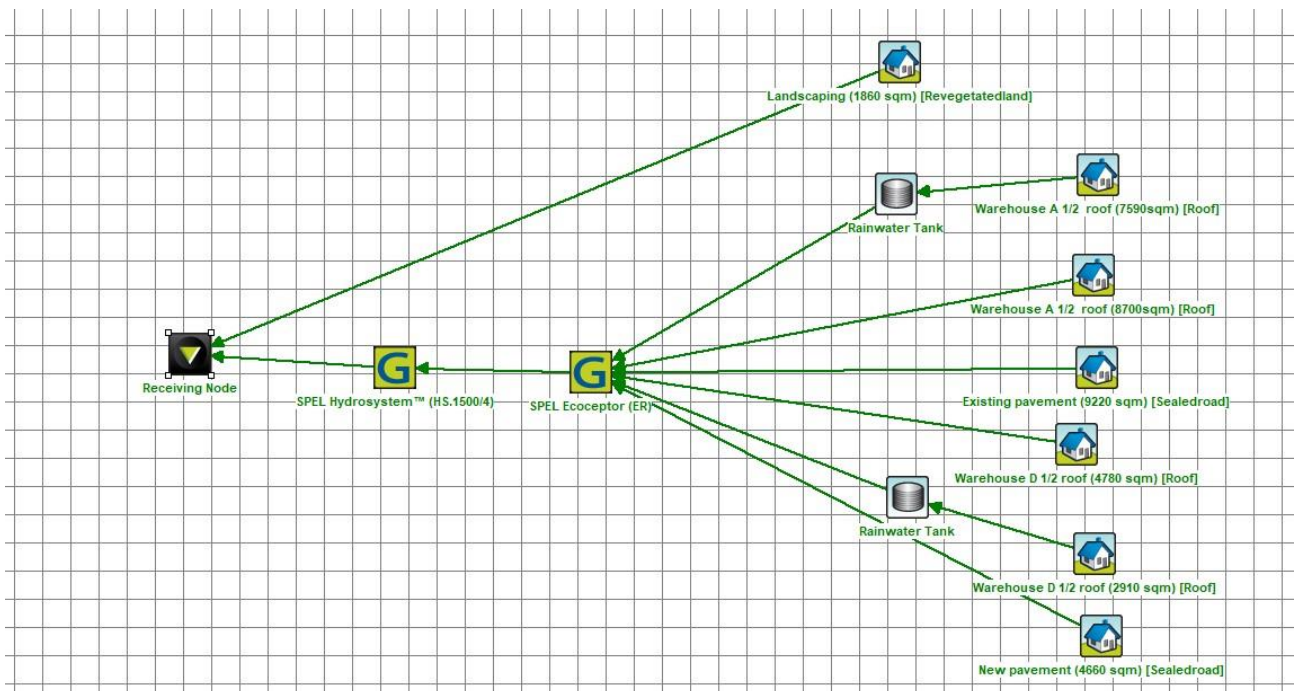


Figure 4 Treatment Train Layout – West site

Treatment Train Effectiveness - Receiving Node			
	Sources	Residual Load	% Reduction
Flow (ML/yr)	31.3	30.3	3.2
Total Suspended Solids (kg/yr)	4030	760	81.2
Total Phosphorus (kg/yr)	9.08	2.86	68.5
Total Nitrogen (kg/yr)	70.4	33.9	51.9
Gross Pollutants (kg/yr)	1140	15.6	98.6

Figure 5 Treatment Train Effectiveness – East site

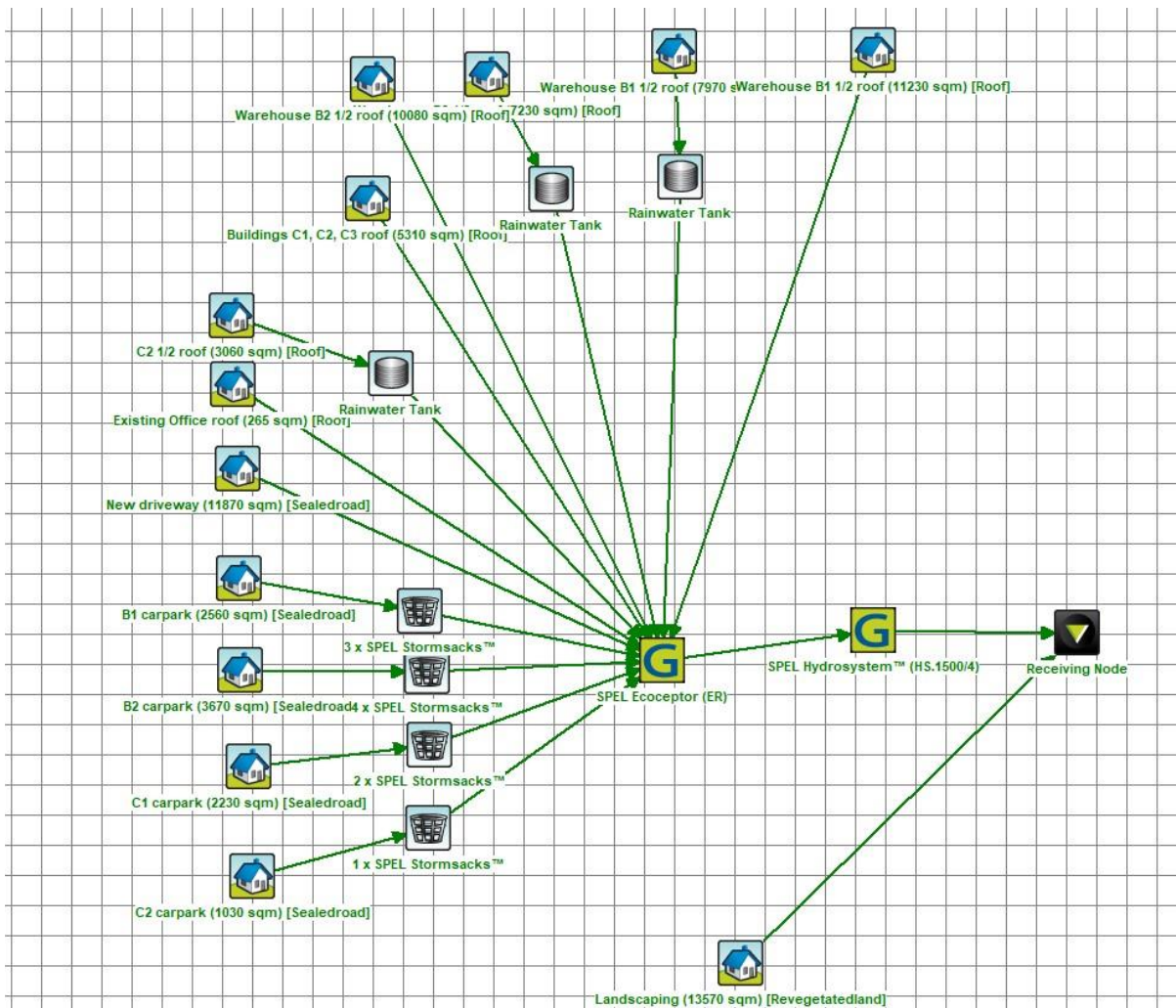


Figure 6 Treatment Train Layout – East site

APPENDIX A

LEGAL POINT OF STORMWATER DISCHARGE & FLOOD LEVEL INFORMATION

MARIBYRNONG CITY COUNCIL

Date: 6/9/2022

Permit No: 9950/ 2022

Trina Bergmann
43 Wantirna Road
RINGWOOD VIC 3134



Phone: 98703022

LEGAL POINT OF STORMWATER DISCHARGE PERMIT PART A

Location: 35-65 Paramount Road TOTTENHAM

Type of Development: Commercial Development

Number of Units:

Legal Point of Discharge:

Permit Fee Paid: \$144.70

MUNICIPAL OFFICES

Napier Street

Footscray

POSTAL ADDRESS

PO Box 58

Footscray

Victoria 3011

DX

DX 81112

Footscray

TELEPHONE

(03) 9688 0200

FACSIMILE

(03) 9687 7793

Comments: Connect to Stoney Creek owned by Melbourne Water. Connection detail is to be to Melbourne Water standards. Justify impervious areas of predevelopment and post development less than 33% otherwise a drainage layout plan with an onsite retention or detention system is to be submitted to Council for approval prior to commencement of building and works with the drainage plan with computations is to be prepared by a qualified Civil Engineer. The required on-site retention and/or detention or both system is to be designed to limit the rate of stormwater discharge from the property to pre-development levels in accordance with the following C=0.4, tso=6mins, ARI 1 in 5. An ARI of 1 in 10 for storage and the greater of post development C=0.75.

Signed:

Samantha Perera 06/09/2022

FURTHER REQUIREMENTS/INFORMATION:

Melbourne Water Requirements

1. This nominated discharge point is subject to Melbourne Water consent. The applicant is responsible for obtaining Melbourne Water' consent and meeting their requirements before undertaking the construction/installation works.
2. Plans, computations and certificate of compliance must be approved by Melbourne Water, prior to submission of drainage plans to Council for consent.
3. The legal point of discharge recommendation is subject to Melbourne Water consent and discharge requirements

Council Requirements / Information

4. This nominated discharge point is based on available Council records which cannot be guaranteed to be accurate. The nominated point should be confirmed on site by the applicant. This discharge point is applicable if it does not involve excavation under the canopy of any existing tree in the road reserve. Please refer to Council Street Tree Policy and Protocol.
5. House drain to kerb and channel – Approved materials UPVC (pressure grade), Cast Iron, concrete.
6. Underground drain outside private property, stormwater pipes should be reinforced concrete (RCP) under trafficable areas or UPVC (sewer grade) under non-trafficable areas.

7. Advise to ring Melbourne One Call Service Inc on 1100 for existing services which may be affected by the proposed drain.
8. Plans and computations (as appropriate) of the proposed drainage work outside the property must be submitted for approval where connection is to Council's kerb & channel or underground stormwater drain or pit.
9. **Please note: A road opening permit is required** for any excavation works in the road or drainage reserve. All works in the road or drainage reserve are to be reinstated to their original and satisfactory condition. The works are to be inspected by Council's Assets Works Inspector (Phone No: 9688 0200), giving at least 2 working days notice. All reinstatement works within the road reservation associated with the drainage construction must be completed within 14 days of the installation of the drain (in cases where a plan is required for an outfall drain, the preceding words should be included on the plan).

MARIBYRNONG CITY COUNCIL

Date: 6/9/2022

Permit No: 9950/ 2022

Trina Bergmann
43 Wantirna Road
RINGWOOD VIC 3134



Phone: 98703022

LEGAL POINT OF STORMWATER DISCHARGE PERMIT – PART B

Location: 35-65 Paramount Road TOTTENHAM

Type of Development: Commercial Development

Number of Units:

Legal Point of Discharge:

Permit Fee Paid: \$144.70

Comments: Connect to Council stormwater drain in Olympia Street at South West corner of property. Connection detail as per MCC Std. Dwg. no. SD D1/A. Drainage layout plan with an onsite retention or detention system is to be submitted to Council for approval prior to commencement of building and works with the drainage plan with computations is to be prepared by a qualified Civil Engineer. The required on-site retention and/or detention or both system is to be designed to limit the rate of stormwater discharge from the property to pre-development levels in accordance with the following C=0.4, tso=6mins, ARI 1 in 5. An ARI of 1 in 10 for storage and the greater of post development C=0.75.

MUNICIPAL OFFICES

61 Napier Street

Footscray

POSTAL ADDRESS

PO Box 58

West Footscray

Victoria 3012

DX

DX 81112

Footscray

TELEPHONE

(03) 9688 0200

FACSIMILE

(03) 9687 7793

Signed: 

Samantha Perera 06/09/2022

FURTHER REQUIREMENTS/INFORMATION:

1. This permit will expire when the Planning Permit expires or "within two years" (should no Planning Permit be applicable)
2. This nominated discharge point is based on available Council records which cannot be guaranteed to be accurate. The nominated point should be confirmed on site by the applicant. Excavation under the canopy of any existing tree in the road reserve will require submission of a Council approved Tree Management Plan as per AS4970, written by Arborist with Australian Qualifications Framework Level 5 or above. Please refer to Council Street Tree Policy and Protocol.
3. House drain to kerb and channel – Approved materials UPVC (pressure grade) or galvanised steel as per specifications in Standard Drawing SD D1.
4. Stormwater drain outside private property should be reinforced concrete (RCP) under trafficable areas or UPVC (sewer grade) under non-trafficable areas as per Maribyrnong City Council standard drawings and specifications.
5. Applicant to undertake Dial Before You Dig (www.1100.com.au) for existing services which may be affected by the proposed drain.
6. **Plans and computations (as appropriate) of the proposed drainage work outside the property must be submitted for approval where connection is to Council's kerb & channel or underground stormwater drain or pit.** Note - Unless otherwise specified in this permit, Drainage Plan approval is not required for single house or house extension work if works do not entail excavation within tree "canopy" (dripline area) or if works do not require a stormwater pump
7. **A Working Within the Road Reserve permit is required** for any excavation works in the road or drainage reserve.

01 September 2022

Trina Bergmann C/- LANDATA
Two Melbourne Quarter, Level 13, 697 Collins Street Docklands

Dear Trina Bergmann C/- LANDATA,

Proposal: Flood level certificates
Site Location : Lot No 1, 35-65 PARAMOUNT ROAD, TOTTENHAM 3012
Melbourne Water reference: MWA-1260749
E flood reference number: 65370605
Date referred: 26/07/2022

Applicable Flood Level:

The estimated flood level for this property is 16.72 metres to Australian Height Datum (AHD), that that has an Annual Exceedance Probability AEP, that is, a 1% probability of being equalled or exceeded in any one year.

A licensed surveyor should be engaged to determine the exact effect of the applicable flood level on the property.

Please note that whilst the above level is based on a storm event that that has an AEP, that is, a 1% probability of being equalled or exceeded in any one year. The property may be affected by more frequent flooding. To determine whether the property is affected by flooding from the local drainage system, please consult your local Council.

Important to note:

Melbourne Water provides flood advice under Section 202(2) of the Water Act 1989.

This letter does not constitute approval for any proposed development for planning or building.

To obtain flow rate velocity information or Melbourne Water's requirements for any proposed development, please contact our Customer Service Centre on 131 722 or make an application [here](#).

The flood level advice provided is based on the most accurate information currently available. This estimated flood information may change and is valid for 3 months from the date of this letter. If you are proposing to develop this land after such time, it is recommended that new advice be obtained from Melbourne Water.

Disclaimer

This letter does not constitute approval for any proposed development for planning or building. Melbourne Water provides flood advice under Section 202(2) of the Water Act 1989.

This certificate provides information as a general reference source only and has taken all reasonable measures to ensure that the material in this letter is as accurate as possible at the time of publication. However, Melbourne Water makes no representation and gives no warranty about the accuracy, reliability, completeness or suitability for any particular purpose of the information. To the full extent that it is able to do so in law, Melbourne Water disclaims all liability, (including liability in negligence), for losses and damages, (including indirect and consequential loss and damage), caused by or arising from anyone using or relying on the information for any purpose whatsoever.

The flood information provided represents the best estimates based on currently available information. This information is subject to change as new information becomes available and as further studies are carried out.

This estimated flood information may change and is valid for 3 months from the date of this letter. If you are proposing to develop this land after such time, it is recommended that new advice be obtained from Melbourne Water.

Advice

For more information in relation to flooding or additional services that Melbourne Water can provide please visit our [website](#).

For general development enquiries contact our Customer Service Centre on 131722.

Regards,

Christina Camilleri
CSR

26 July 2022

Trina Bergmann C/- LANDATA

Two Melbourne Quarter, Level 13, 697 Collins Street Docklands

Dear Trina Bergmann C/- LANDATA,

Proposal: Flood level certificates

Site Location : Lot No 1, 35 PARAMOUNT ROAD, TOTTENHAM 3012

Melbourne Water reference: MWA-1260749

Eflood reference number: 65370605

Date referred: 26/07/2022

Flooding may be associated with the Melbourne Water regional drainage system and/or the local Council drainage systems. Information available at Melbourne Water indicates that the property is not subject to flooding from Melbourne Water's drainage system, based on a rainfall event which has a 1% Annual Exceedance Probability (AEP), that is, a 1% probability of being equalled or exceeded in any one year. To determine if a property is subject to flooding from the local Council drainage system you will need to contact the relevant Council for flood information.

For the purposes of the Building Code of Australia - Building in Flood Hazard Areas, there is no applicable flow rate velocity associated with the above property. Melbourne Water does not have any information in relation to flow velocities associated with the local Council drainage system.

Important to note:

Melbourne Water provides flood advice under Section 202(2) of the Water Act 1989.

This letter does not constitute approval for any proposed development for planning or building.

To obtain more information or Melbourne Water's requirements for any proposed development, please contact our Customer Service Centre on 131 722 or make an application [here](#).

The property may be affected by flooding from lesser and more frequent flood events or from the local drainage system. To determine if your property is affected by the local drainage system, please consult your local council.

The flood level advice provided is based on the most accurate information currently available. This estimated flood information may change and is valid for 3 months from the date of this letter. If you are proposing to develop this land after such time, it is recommended that new advice be obtained from Melbourne Water.

For more information in relation to flooding or additional services that Melbourne Water can provide please visit our [website](#).

For general development enquiries contact our Customer Service Centre on 131 722.

Regards,

Melbourne Water Corporation
Customer Service Centre

APPENDIX B

COMPUTATIONS

COMPUTATION

SHEET No. 1
 JOB No. 22/170
 DATE Aug '22
 MADE BY JB

JOB Tottenham
 SUBJECT West Site

DAVIS NAISMITH & MCGOVERN PTY LTD CONSULTING ENGINEERS

Detention Requirements - WEST SITE

Limit post development discharge for 1:100 year ARI to pre development 1:10 yr ARI discharge.

PRE DEVELOPMENT

Site Area = 39,633 m²

Max Flow length, L = 332m

Roughness coefficient, n^a = 0.10 (short grass)

Fall across site = 26.1 - 22.0 = 4.1m.

Slope, S = $\frac{4.1}{332} = 0.0123 \text{ m/m}$.

$$t_c = \frac{6.94 (L \cdot n^a)^{0.6}}{I^{0.4} \cdot S^{0.3}}$$

Impervious area = A_{roof} + A_{pavement/carparking}

Warehouse A roof = 16411 m²

Warehouse D roof = 6234 m²

Existing pavement = 14043 m²

new pavement = 1503 m²

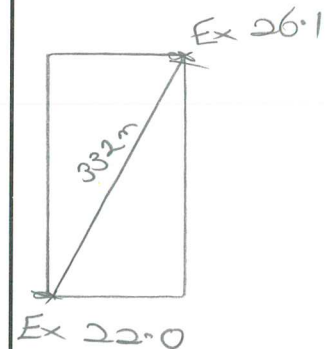
38191 m²

Landscaping = 1442 m²

Fraction Impervious = $\frac{38191}{39633} = 0.96$

By Iteration, t_c = 41 min ¹⁰⁰I₄₁ = 60.8 mm/hr

$$t_c = \frac{6.94 (332 \times 0.1)^{0.6}}{60.8^{0.4} \times 0.0123^{0.3}} = 41.1 \text{ min}$$



COMPUTATION

SHEET No. 2
 JOB No. 22/170
 DATE Aug '22
 MADE BY B

JOB Tottenham
 SUBJECT West Site

DAVIS NAISMITH & MCGOVERN PTY LTD

CONSULTING ENGINEERS

Runoff Coeff.

$$^{10}I_1 = 27.9 \text{ mm/h} \quad ^5I_1 =$$

$$F_y = 1.2 \text{ for ARI} = 100 \text{ yrs.}$$

$$C_{100} = F_y C_{10} \\ = 1.2 [0.1 + 0.0133 \times (27.9 - 25)] = 0.167$$

Predevelopment flow,

$$Q_p = \frac{C_{100} I A}{360} = \frac{0.167 \times (60.8 \times 39633)}{3600} \\ = 111.8 \text{ l/s.}$$

Post development flow,

$$C_{10}' = 0.1 + 0.0133 \times (^{10}I_1 - 25) \\ = 0.1 + 0.0133 \times (27.9 - 25) \\ = 0.139$$

$\frac{1}{2}$ developed = 96%

$$C_{10} = 0.9 \times f + C_{10}' \times (1 - f) \\ = 0.9 \times 0.96 + 0.139 \times (1 - 0.96) \\ = 0.870$$

$$\text{Maximum outflow} = \frac{C_{10} I A}{3600} = \frac{0.870 \times 78.3 \times 39633}{3600} \\ = 345 \text{ l/s.}$$

10 yr:

$$\therefore \text{Detention volume} = 252 \text{ m}^3 \\ \text{Critical storm} = 19 \text{ min.}$$

$$I_{\text{init}} = \frac{345}{2} \\ = 173 \text{ l/s.}$$

$$\text{Outflow (int)} \\ = 111.8 \\ \underline{\quad} \\ = 55.9 \text{ l/s.}$$

$$n^* = 0.01 \text{ (conc)} \\ t_c = 9.3 \text{ min} \\ I = 78.3 \text{ mm/hr}$$

$$\text{ARI 1 in 5:} \\ C = 4 \\ t_{50} = 6 \text{ min} \\ \text{ARI 1 in 10:} \\ C = 0.75$$

$Q = 345 \text{ l/s}$
 345 l/s
 173 l/s

COMPUTATION

JOB. Tottenham
SUBJECT. WEST SITE

SHEET No. 3
JOB No. 22/170
DATE Aug '22
MADE BY JB

DAVIS NAISMITH & MCGOVERN PTY LTD

CONSULTING ENGINEERS

MUSIC MODEL:

- 30 KL water tank to each Warehouse.
- Brodetention swales $180\text{m}^2 \times 2$
to exist pavement & new carpark.
- SPEL EXCEPTOR 8000 series.

COMPUTATION

SHEET No. 4
 JOB No. 22/170
 DATE Aug '22
 MADE BY JB

JOB. Tottenham
 SUBJECT East site

DAVIS NAISMITH & MCGOVERN PTY LTD

CONSULTING ENGINEERS

Detention Requirements - EAST SITE

Limit post development discharge for 1:100 year ARI to pre development 1:10yr ARI discharge.

PRE DEVELOPMENT

Site Area = $80,167 m^2$

Max Flow length, $L = 406 m$

Roughness coefficient, $n^* = 0.10$ (short grass)

Fall across site = $25.4 - 17.5 = 7.9 m$

Slope, $S = \frac{7.9}{406} = 0.0195 m/m$

$$t_c = \frac{6.94(L \cdot n^*)^{0.86}}{I^{0.4} \cdot S^{0.23}}$$

Impervious area = $A_{roof} + A_{pavement/carparking}$

Warehouse B1 roof = $16670 m^2$

Warehouse B2 roof = $15096 m^2$

Building C1, C2, C3 roof = $7218 m^2$

Existing office roof = $278 m^2$

New driveway = $14417 m^2$

B1 carpark = $4236 m^2$ (incl. fire track)

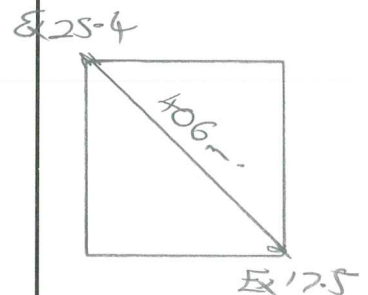
B2 carpark = $3348 m^2$

C1 carpark = $2227 m^2$

C2 carpark = $1068 m^2$

64558 m²

Fractⁿ Impervious = $\frac{64558}{80167} = 0.81$



Landscaping
 = $15609 m^2$

COMPUTATION

JOB: Tottenham
 SUBJECT: East Site

SHEET No. 5
 JOB No. 22/170
 DATE: Aug '22
 MADE BY: ZB

DAVIS NAISMITH & MCGOVERN PTY LTD

CONSULTING ENGINEERS

By iteration, $t_c = 40.1 \text{ min}$ ${}^{10}I_{40} = 61.7 \text{ mm/hr}$

$$t_c = \frac{6.94(406 \times 0.1)^{0.6}}{61.7^{0.4} \times 0.0195^{0.3}} = 40.1 \text{ min.}$$

1-5963

Runoff coeff ${}^{10}I_1 = 27.9 \text{ mm/hr}$

$F_y = 1.2$ for ARI = 100yrs

$$C_{100} = F_y C_{10} = 1.2 [0.1 + 0.0133 \times (27.9 - 25)] = 0.167$$

$$Q_p = \frac{CIA}{3600} = \frac{0.167 \times (61.7 \times 64558)}{3600} = 184.8 \text{ l/s} \rightarrow$$

Predevelopment Flow,

$$C_{10}' = 0.1 + 0.0133 \times ({}^{10}I_1 - 25) = 0.1 + 0.0133 \times (27.9 - 25) = 0.139$$

% developed = 81%

$$C_{10} = 0.9 \times f + C_{10}' \times (1 - f) = 0.9 \times 0.81 + 0.139 \times (1 - 0.81) = 0.755$$

$$\text{Maximum outflow} = \frac{CIA}{3600} = \frac{0.755 \times 79.1 \times 80167}{3600} = 700 \text{ l/s}$$

10yr:

∴ Detention volume = 1365 m^3
 Critical Storm = 116 mm

Outflow init = $\frac{185}{2} = 9.25$

ARI 1 in 10:
 $C = 0.75$
 Outflow max = 700
 Outflow init = 350

$n^k = 0.01$ (conc)
 $t_c = 9.1 \text{ min}$
 $I = 79.1 \text{ mm/hr}$

ARI 1 in 5
 $C = 0.4$
 $t_{50} = 6 \text{ min}$

COMPUTATION

JOB Tottenham
SUBJECT EAST SIDE

SHEET No. 6
JOB No. 22/170
DATE AUG '22
MADE BY TB

DAVIS NAISMITH & MCGOVERN PTY LTD

CONSULTING ENGINEERS

MUSIC MODEL:

- 30 KL water tank to Warehouse B1
x 3 B2
C2
- Bioretention swales 120m² - B1 carpark
x 4 80m² - B2 carpark
80m² - C1 carpark
80m² - C2 carpark
- SPEL ECOCEPTOR 6000 series.

APPENDIX C

SPEL STORM WATER TREATMENT PRODUCT SPECIFICATIONS



SPEL ECOCEPTOR™

www.spel.com.au

SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS



Introduction

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 to statutory guidelines across Australia. It has been independently tested in Australia and is suitable for all types of conditions and soil-type loadings.

It separates and captures sediments, silt, total suspended solids, nutrients and total petroleum hydrocarbons (TPH) and oil and 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.

Areas with a high fraction of impervious surfaces, including car parks, ports, streetscapes, roads, subdivisions and industrial estates that require stormwater treatment are ideal for the SPEL Ecoceptor. MUSIC node is available on request.

The one-piece, self-contained fibreglass construction, is lightweight and yet robust in strength making it simple and cost-effective when performing installations.

No site assemblage is required as is the case with the heavier concrete devices. The SPEL Ecoceptor fibreglass SQID can be installed in all types of trafficable zones, including vehicular truck (Class D) and aircraft loadings (Class G).

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 and grease are removed without sticking to the sides of the internal walls.

Flow rates on standard units of up to 1400 LPS and can fit pipe sizes from 225mm to 1200mm (other sizes available on request.)



Maintenance

INSPECTION AND CLEANING

The regularity of inspections of the SPEL Ecoceptor is contingent on the features and properties of the catchment area.

SPEL recommends an inspections of the Ecoceptor at the end of the first month after installation to determine the volume of trapped silt and pollutants.

Information sourced can be useful in factoring the frequency of on-going inspections or cleaning operations.

In the event of excessive rain or an oil spill, an inspection is recommended immediately upon such an event.

Ascertain silt depth and if build-up is evident, then a vacuum-loader truck should be engaged for the cleaning of the tank.

SPEL Ecoceptor cleaning procedure is simple, by simply lifting the external lid (two persons may be required), resting it securely in a safe manner and then inserting suction hose into the chamber.

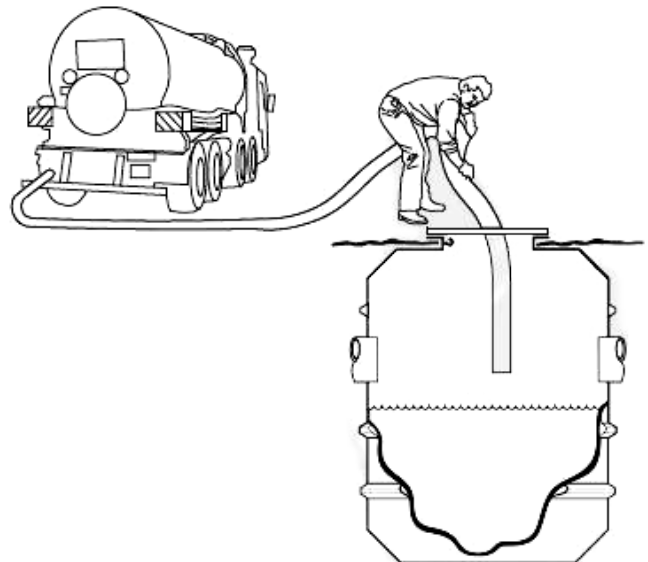
Ensure that the chamber is thoroughly cleaned of all refuse and debris before accessing the chamber - if required.

The chamber is cleaned by inserting the suction hose through the manhole at ground level.

Always commence cleaning from the inlet side of the chamber and ensure on completion of the cleaning operation that the lid is secured to its normal position (and locked if necessary) before departing the site.

IMPORTANT

In the unlikely event of the chamber having to be entered ensure absolutely that all Workplace Health and Safety directives and Confined Space Regulations are strictly adhered to, including wearing long-arm rubber gloves and the appropriate footwear in the event of coming into contact with sharp objects.





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STATE CONTACTS

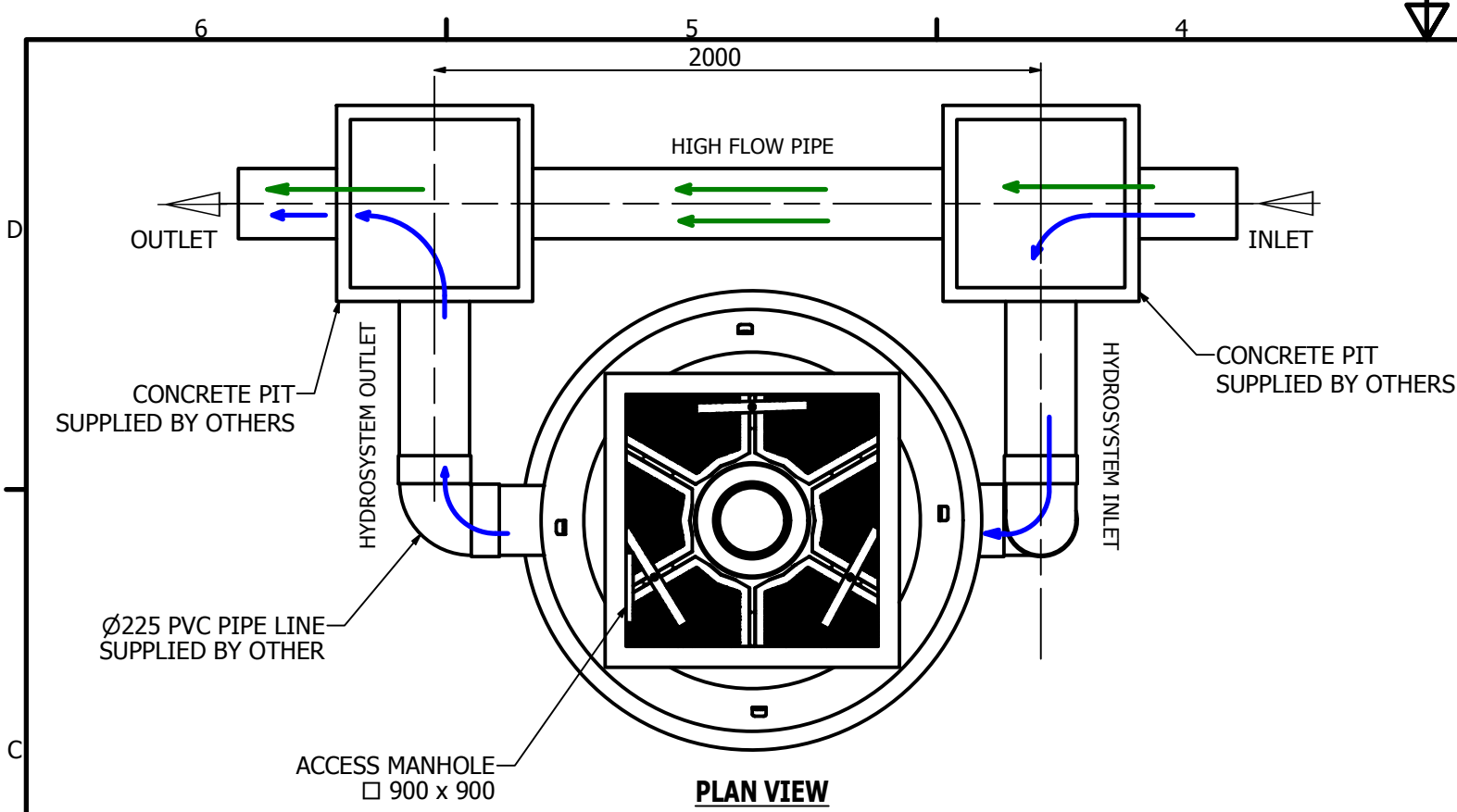
New South Wales	61 2 8838 1055
Canberra	61 2 6128 1000
Queensland	61 7 3277 5110
Victoria & Tasmania	61 3 5274 1336
South Australia	61 8 8275 8000
West Australia	61 8 9350 1000
Northern Territory	61 2 8838 1055
New Zealand	64 9 276 9045



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REVISION HISTORY				
REV	DESCRIPTION	DESIGNER	DATE	APPROVED
1	INITIAL RELEASE	P.Z.	17/07/2018	



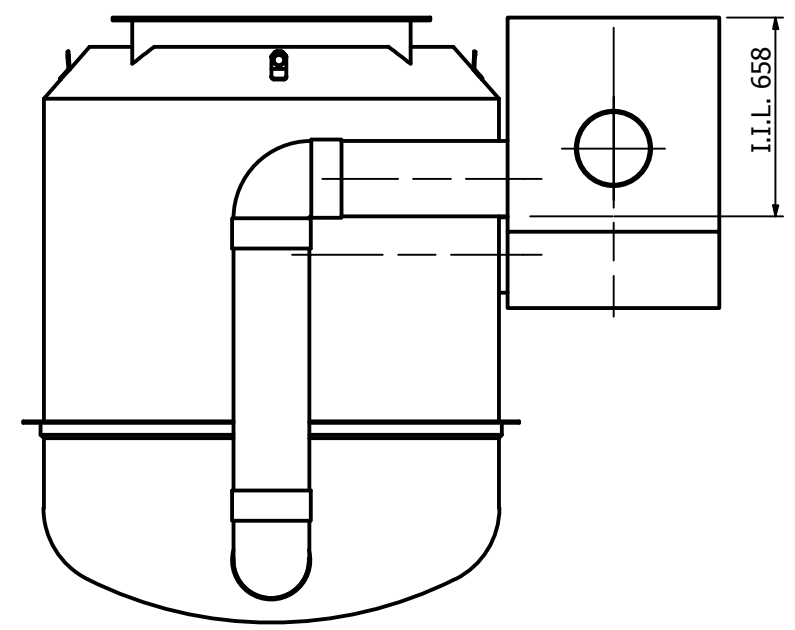
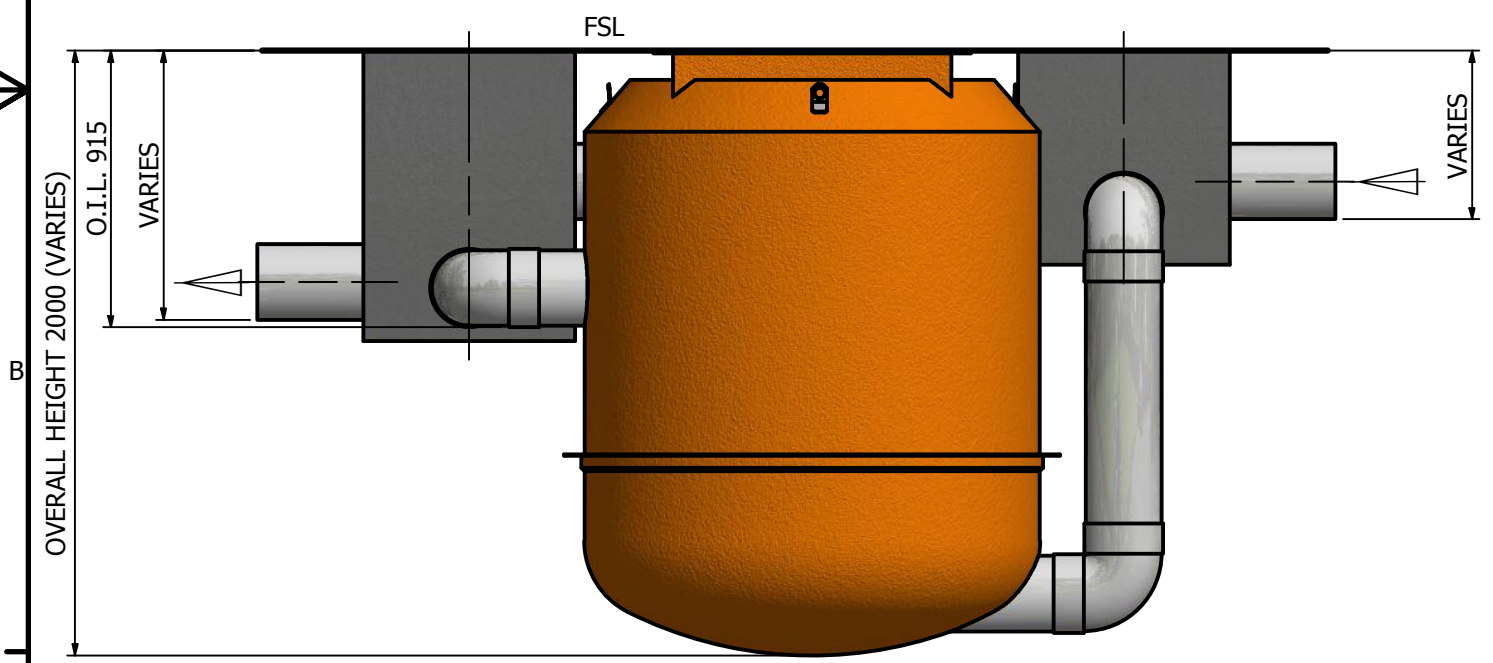
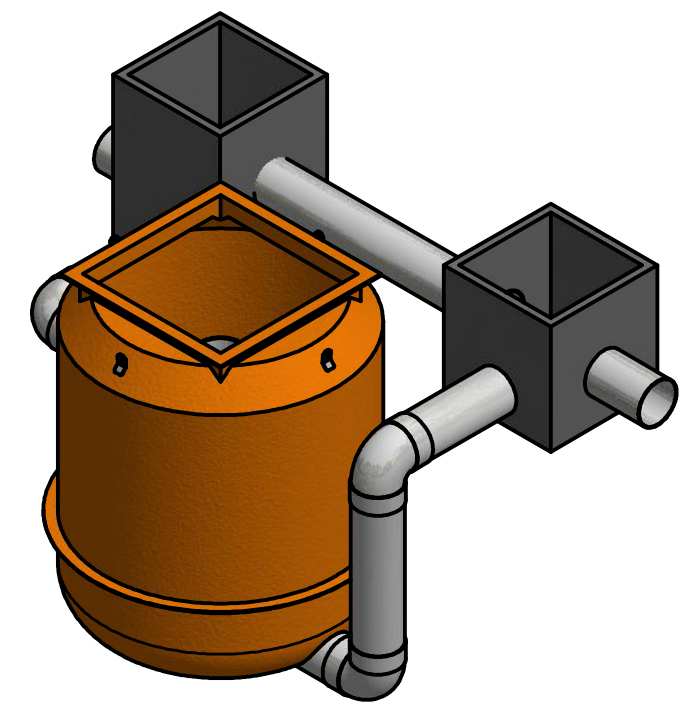
Site Level Confirmation	
Finished Surface Level (FSL) RL:	
Access Cover Thickness	mm
Inlet Invert Level RL:	
Outlet Invert Level RL:	
Company:	
Name:	
Date:	

APPROVED.....

NAME.....

SIGNED.....

DATE...../...../.....



ISSUE FOR APPROVAL

NOT FOR CONSTRUCTION

← HIGH FLOW BYPASS

← TREATMENT FLOW

NOTICE:
SYSTEM PIPEWORK MUST HAVE AT LEAST 250 MM OF FALL TO OPERATE CORRECTLY.

TOLERANCE: ALL DIMENSIONS 10mm UNLESS OTHERWISE STATED.

CLIENT:

DISTRIBUTOR :

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Drawn	Date
P.Z.	17/07/2018
Check	Date
Verified	Date
Approved	Date
Request No.	
RN2945	

SPEL
ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS

100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au

PROJECT :			
TITLE SPEL HYDROSYSTEM 1500 SHS.150D-1500C-06.225.PVC FRP TANK 1500 DIA. HYDROSYSTEM 1500 GENERAL ARRANGEMENT			
SCALE	N.T.S	SIZE	A3
SHEET	1	REV	1
CUSTOMER CODE :		DWG No. SP18-HY20730-S	

D:\Vault Working Folder\Designs\SPEL\PRODUCTS\HYDROSYSTEM\1500 SERIES\STANDARD LAYOUT\SP18-HY20730-S.dwg



SPELFilter Hydrosystem

Environmentally aware and efficient.

www.spel.com.au

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 fraction and above, takes place in the hydrodynamic separator. This is due to turbulent secondary flows within a radial laminar flow regime.
3. The settleable 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

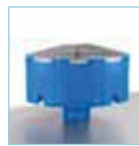
Stormwater filter complying with DIN 1989-2. Connections: DN 200; the various types of filter elements have different material structures.

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

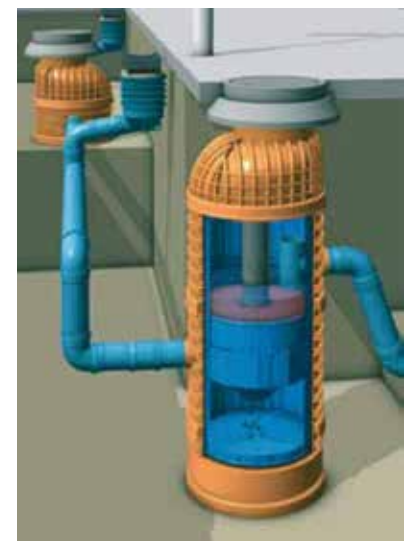
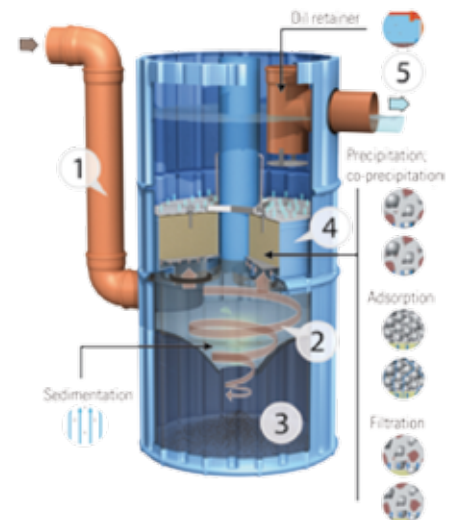
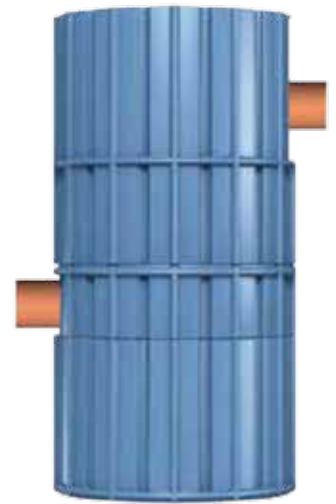
Accessories 1

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

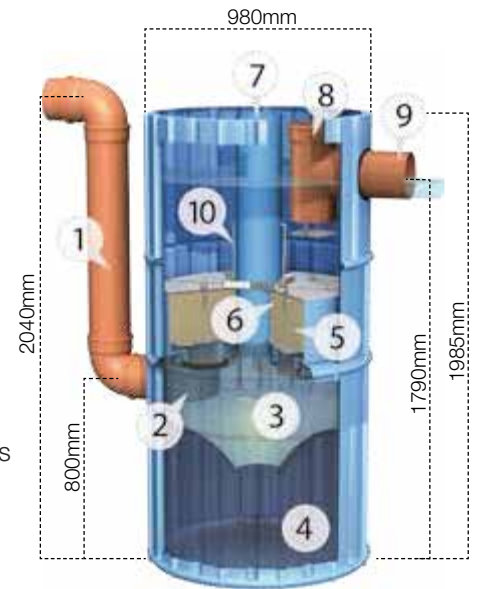


Example:

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.

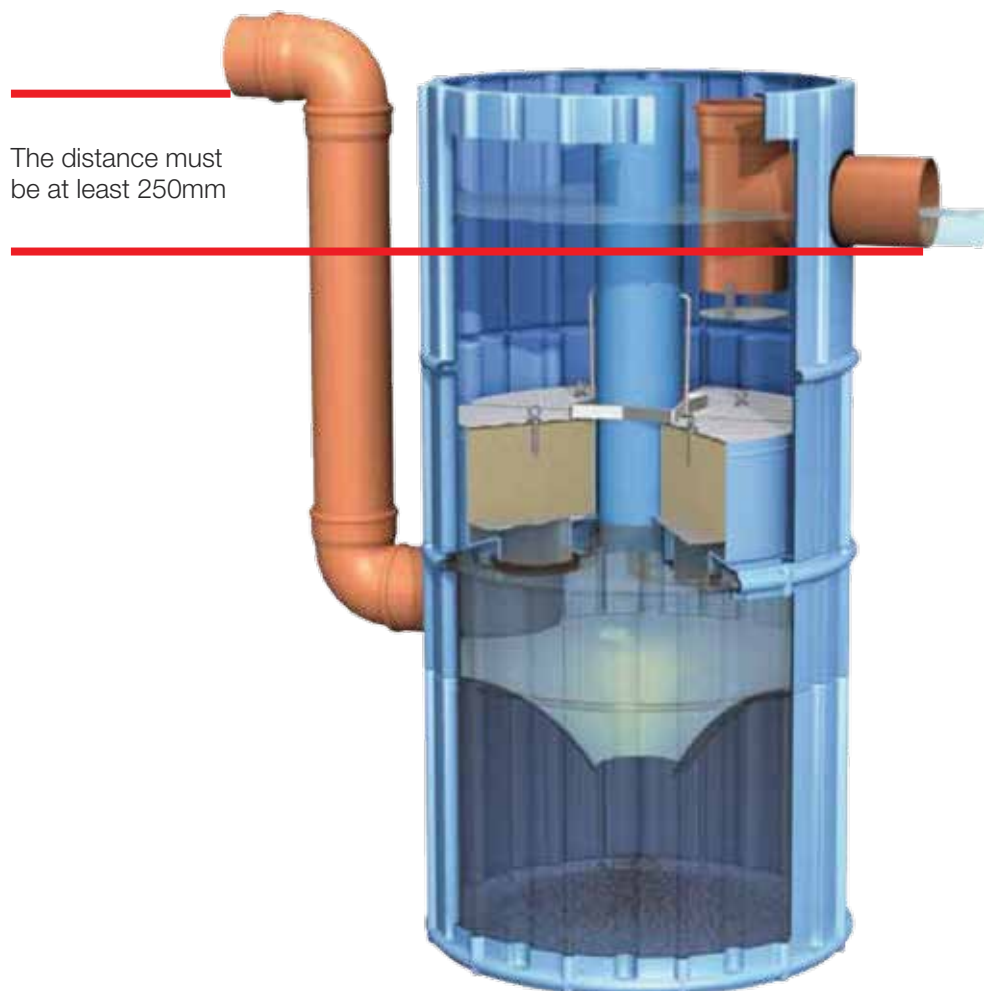
Type	Nature of the surface to be drained	Weight of filter element / piece	Total Weight
Heavy traffic with technical approval (Z-84.2-4)	Highly polluted traffic areas (car parks in front of supermarkets, main roads, HGV access roads)	54kg	300kg
Traffic	Slightly polluted traffic areas (side streets, staff 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 Permissible 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.



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APPENDIX D

SPEL STORM WATER TREATMENT MAINTENANCE SCHEDULE

SPEL provide maintenance of their stormwater treatment systems as part of their ongoing works, below is a typical maintenance schedule from a SPEL maintenance contract. The building owner will be required to maintain the SPEL units in accordance with the manufacturer's requirements.

SPEL STORMWATER QUALITY TREATMENT DEVICE MAINTENANCE AGREEMENT

FOR

CLIENT NAME

Located at 1-5 Gladstone Road, Dandenong, VIC

This Equipment Maintenance Agreement (the "Maintenance Agreement") is made and effective

DATE,

BETWEEN: AKS Industries Australia Pty Ltd (the "Service Provider"), of
191 Station Street, Corio VIC 3214 (ABN: 88 151 483 984) hereafter known as AKS

AND: CLIENT NAME (the "Client"), of
CLIENT ADDRESS

SUMMARY

**This 10 year maintenance contract covers the monitoring and servicing of the SPEL Stormsacks and the
SPEL Hydrosystem at the Kaufland Commercial Development
Located at 1-5 Gladstone Road, Dandenong VIC**

Where the Client has requested the provision of maintenance and the Service Provider is willing to provide such services as per the terms of this agreement both parties agree to:

1. WARRANTY:

SPEL warranty on the SPEL Hydrosystem is 12 months. Goods sold shall only have the benefit of a manufacturer's warranty if the purchaser has complied with the manufacturer's instructions in relation to installation, maintenance and operation of the said goods.

2. MAINTENANCE CALLS:

Service Provider agrees to provide maintenance service of one [1] maintenance calls annually and interim calls as required at the installation address specified above on the equipment listed. All charges specified are those currently in effect and are subject to change only at the time of subsequent annual renewal. If the charges are increased, the Client may, as of the effective date of such increase, terminate this Agreement by written notice to the Service Provider. Otherwise, the new charges shall become effective upon the date specified in the renewal invoice. Client calls hereunder are restricted to the normal working hours of the Service Provider.

All service commenced outside of Service Provider's normal working hours will be charged at published rates for service time and expense only.

3. SERVICES:

The following services are included:

Maintenance Summary

The SPEL Hydrosystem and Stormsacks will be inspected annually. The SPEL Hydrosystem change out maintenance process comprises the removal and replacement of each SPEL Hydrosystem cartridge and the cleaning of the silt out of the vault or manhole with a vacuum truck. In the event these works are required, Client will be notified accordingly. The AKS personnel that enter the tank [if necessary] will be trained in confined space entry

Life Cycle Cost (LCC) – The maintenance requirements for the SPEL Hydrosystem is very site specific and actually relates to the sediment load and sediment characteristics.

Maintenance Triggers

The basic activities included in the maintenance contract are as follows:

- Visual inspection of the vault and filter conditions annually
- If there is a silt build up, it needs to be vacuumed out accordingly
- TSS accumulation in the filters is what dictates the life cycle of individual filter.

Optimum performance of the equipment covered by this Agreement can be expected only if supplies provided by, or meeting the specifications of Service Provider are used. Service Provider shall have full and free access to the equipment to provide service thereon. If persons other than Service Provider's representatives perform maintenance or repairs, and as a result further work is required by Service Provider to restore the equipment to operating condition, such repairs will be billed at Service Provider's published time and material rates then in effect.

4. ANNUAL RATE FOR SERVICES:

ACTIVITY	FREQUENCY [subject to site characteristics]	VALUE [subject to CPI index]
SPEL Stormsack – Visual inspection of each sack, if minimal pollutant it will be emptied into the onsite waste bins. SPEL Hydrosystem - Visual inspection for sediment accumulation	Year 1 & 2 - Every six months Year 3 – 10 – Once per year	\$470.83+GST per site visit for this project. The ten (10) year total for inspections is \$5,650.00+GST
Silt Removal When required the SPEL Stormsack and SPEL Hydrosystem will need the silt vacuumed out. AKS will supply vacuum truck and labour to maintain the system.	This is dictated by silt condition on the site, detected through the site inspections. AKS have allowed for one (1) maintenance supervision per annum.	AKS supervision will be \$637.50+GST / visit, additional equipment (Sucker truck ect) will be on a cost plus basis. The ten (10) year total for maintenance (excluding sucker truck) is estimated \$6,375+GST
SPEL Hydrosystem replacement – allowance for one filter change out of each SPEL Hydrosystem throughout a 10 year period (If required)	We estimate the life of the SPEL Hydrosystem to be between 5 – 7 years, subject to silt condition on the site.	The replacement value is \$12,300 per SPEL Hydrosystem including the labour and management for the day.
SUMMARY		
Based on the selection above the, annual rate is \$2,579.58.00+GSTp.a. This comprises of the above inspection schedule, maintenance and associated reporting spread over the 10 year contract. The annual rate shall be paid in advance as at the renewal date each year. The annual rate shall be indexed by CPI at each annual renewal date (If applicable). Any payment not made by the 30 th day of the month shall be considered overdue and in addition to Service Provider's other remedies, Service Provider may levy a late payment charge equal to 4% per month on any overdue amount.		

5. PAYMENTS:

For service as specified above on the equipment listed, the undersigned Client agrees to pay in advance the total annual charge specified below to Service Provider, in accordance with the terms specified on the face of the invoice.

There shall be added to the charges provided for in this Agreement amounts equal to any taxes, however designated, levied or based on such charges or on this Agreement, or on the services rendered or parts supplied pursuant hereto, including GST.

6. BINDING AGREEMENT:

The undersigned Client represents that he is the owner of the equipment, or that they have the owner's authority to enter into this agreement.

This Agreement is subject to acceptance by Service Provider. It takes effect on the date written above and continues in effect for ten years and will remain in force thereafter, with automatic annual renewal at the indexed rates, until cancelled in writing by either party or at the end of a 10 year period – whichever is earlier.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

AKS Industries Australia Pty Ltd
ACN 151 483 984

of 191 Station Street, Corio VIC 3214

CLIENT

Authorized Signature

Authorized Signature

Kurt Jensen – Environmental Division Manager

Client Print Name and Title

SPEL

191 Station Street
Corio VIC 3214

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