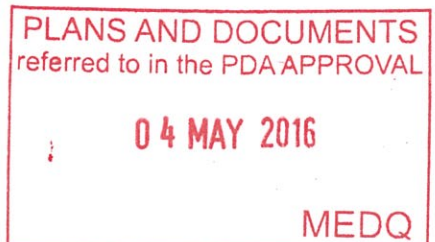


McVeigh

**Fison Ave West,
Eagle Farm**

**Site Based Stormwater Management Plan
December 2015**

Report Prepared by McVeigh Consultants for



Report Title	Site Based Stormwater Management Plan		
Revision	1		
Author(s)	Jacob McVeigh/Zhixin Dai	Initials	JM/ZD
Date	18 December 2015		
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Authorised by:



Daniel Ting RPEQ 05784

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION & SITE CHARACTERISTICS.....	2
2.0 WATER QUANTITY MANAGEMENT.....	3
2.1 LAWFUL POINT OF DISCHARGE	3
3.0 WATER QUALITY MANAGEMENT	4
3.1 APPLICABLE WATER QUALITY OBJECTIVES AND GUIDELINES.....	4
3.2 POLLUTANT EXPORT MODELLING	4
3.2.1 Model Setup	4
3.2.2 Treatment Measure Parameters	5
3.2.3 Model Results.....	6
3.3 MAINTENANCE	6
3.3.1 Construction Phase	6
3.3.2 Operational Phase.....	6
4.0 SITE FLOODING.....	8
4.1 required building level	8
4.2 overland flow	9
4.2.1 FISON AVENUE W	9
4.2.2 Eagleview Place	11
4.2.1 ADJACENT DEVELOPMENT	12
5.0 CONCLUSIONS.....	13

APPENDIX A – SITE SURVEY & CIVIL DRAWINGS

APPENDIX B – MUSIC RESULTS

APPENDIX C – FLOODWISE PROPERTY REPORTS

APPENDIX D - HUMES JELLYFISH MAINTENANCE REQUIREMENTS

APPENDIX E – STOMRWATER QUANTITY CALCULATIONS

APPENDIX F – WHYBIRD FARR REPORT

EXECUTIVE SUMMARY

This report has been prepared to analyse the impacts of the proposed development on stormwater quality and quantity and address the Brisbane City Council guidelines regarding stormwater management and flooding.

The proposed development comprises of a portion of Lot 801 on SP108968 with a total developable site area of approximately 1.23 ha. The remaining area of Lot 801 on SP108968 is already fully developed and does not form part of the proposed development. The proposed development site area currently consists of a portion of gravel hardstand and vegetation. The proposed development is for a warehouse with associated car parking, hardstand and office.

The site currently directs runoff to the south. The proposed lawful point of discharge for the proposed development is to generally match existing.

The proposed development is a material change of use for industrial purposes that involves a land area greater than 2,500m² and results in an impervious area greater than 25%. Therefore it is subject to the requirements of the State Planning Policy July 2014 (SPP) for stormwater treatment and must demonstrate compliance with required mean annual pollutant load reductions. To demonstrate compliance, an analysis of the proposed development stormwater quality has been completed using Model for Urban Stormwater Improvement Conceptualisation (MUSIC). The model indicates the proposed stormwater quality treatment train for the development provides reductions of total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and gross pollutants (GP) in accordance with the requirements.

Stormwater quantity management has also been considered. An analysis of the receiving catchment has concluded that no onsite detention measures are required for the proposed development.

The site is subject to a range of flooding criteria. The proposed development will provide adequate solutions to cater for flooding management.

1.0 INTRODUCTION & SITE CHARACTERISTICS

This report has been prepared for the proposed industrial development of Lot 801 on SP108968, 65 Links Ave S, Eagle Farm. This report addresses the requirements of Brisbane City Council regarding stormwater management.

The site is bound to the north by Fison Ave West, the east and the west by industrial developments and to the south by a drainage easement. The eastern developed portion of the site is currently occupied by tenant AE Smith. This existing developed area does not form part of this approval.

An aerial photograph presented in Figure 1 captures existing site features.



Figure 1 – Existing site aerial photograph. Source: Google Earth – QLD Globe

The site contains three existing easements A, D and E, located along the southern and western boundaries. All easements are in favour of Brisbane City Council. Easements D and E are for the purpose of drainage-underground pipe drainage system and Easement A is for the purpose of drainage-overland flow.

The proposed development consists of an industrial warehouse with associated car parking, hardstand and office. Development access will be via Fison Avenue West.

Refer to the Site Survey and Civil drawings in Appendix A and architectural drawings, for the proposed development layout.

2.0 WATER QUANTITY MANAGEMENT

2.1 LAWFUL POINT OF DISCHARGE

The proposed lawful point of discharge for the proposed development is to the south towards the existing Council drainage way.

The runoff from the proposed development site is to discharge downstream to the south via an existing drainage way. This drainage way should carry adequate capacity from the runoff generated from the proposed site on the basis that the easement is originally intended for a larger catchment flow prior to the completion of Southern Cross Way. It is not anticipated the runoff generated from the proposed development will adversely impact on downstream properties. It is also noted that the development site is located with the discharge point to the south; the majority of the contributing catchment to the Council drainage way is upstream of this point. As such no onsite detention is deemed necessary for the proposed development.

3.0 WATER QUALITY MANAGEMENT

3.1 APPLICABLE WATER QUALITY OBJECTIVES AND GUIDELINES

The following Guidelines & Regulations were used for the design and modeling of the stormwater quality treatment train:

- Healthy Waterways *Water Sensitive Urban Design Technical Design Guidelines for South East Queensland* Version 1 – June 2006
- Water by Design *MUSIC Modeling Guidelines* Version 1. – 2010
- Queensland Government Natural Resources and Water *Queensland Urban Drainage Manual* Volume 1, Second Edition - 2007
- State Planning Policy July 2014 (SPP)

In order to determine the water quality objectives for the site, the State Planning Policy July 2014 (SPP) was considered. The SPP applies to the proposed development since it is a material change of use greater than 2500m² which involves greater than 25% impervious area. As per the Guidelines the site must meet the following minimum reductions in mean annual loads for the operational phase for Southeast Queensland:

Table 1 – Mean Annual Load Reductions

Pollutant	Reduction Required (%)
Total Suspended Solids (TSS)	80
Total Phosphorus (TP)	60
Total Nitrogen (TN)	45
Gross Pollutants (GP)	90

3.2 POLLUTANT EXPORT MODELLING

3.2.1 Model Setup

The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.1.0 was used to analyse the proposed development. The model was setup in accordance with Water by Design MUSIC Modeling Guidelines. An industrial land use was assigned to the site in order to determine the recommended MUSIC rainfall-runoff parameters. The split catchment approach in which separate roof and road source nodes are modeled has been used to generate pollutant export parameters. Rainfall data was obtained from Station 40223 of Brisbane. Rainfall data from 1/01/1980 to 31/12/1989 with a 6 minute modeling time step was utilised.

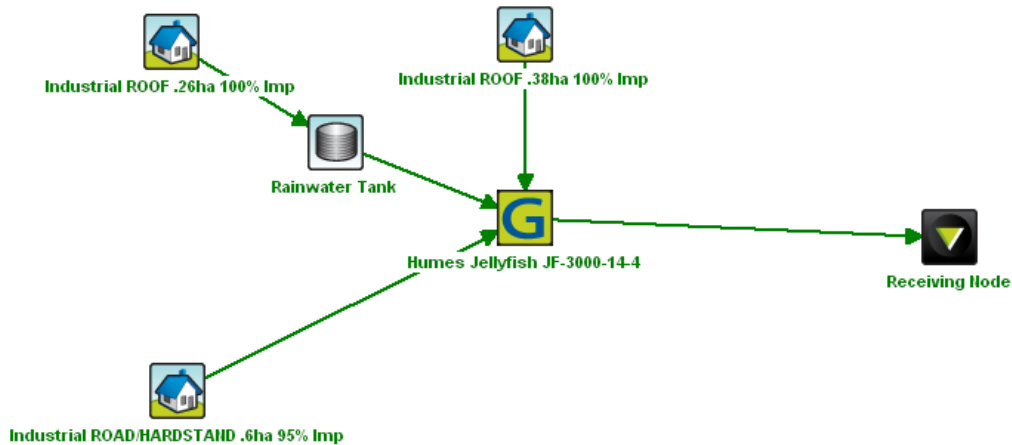


Figure 2 –MUSIC model setup.

All site catchment areas located within the proposed development area are to be collected and directed towards the proposed proprietary filter devices prior to discharging to the lawful point of discharge. There is 40% of the roof catchment directed towards rainwater tanks prior to the proprietary filter devices.

3.2.2 Treatment Measure Parameters

The treatment measures proposed within the site are rainwater tanks and proprietary filter devices. Table 2 presents the relevant catchments and areas. Table 3 and 4 present the treatment train systems and parameters.

Table 2 – Site Catchments

Catchment	Area	Impervious Coverage (%)	Treatment Train
	(ha)		
Roof	0.38	100	Humes JellyFish
Roof	0.26	100	Rainwater Tank → Humes JellyFish
Road	0.60	95	Humes JellyFish

Table 3 – Rainwater Tank Parameters

Rainwater Tank Parameter	90kL
Volume Beneath Overflow Pipe (kL)	90
Surface Area (m ²)	38
Overflow Pipe Diameter (mm)	100
No. of Employees	10
Flush per Employee (flush/day)	2.3
Toilet Reuse (L/flush)	3.6
Toilet Reuse (kL/day)	0.082
Irrigation Area (m ²)	300
Irrigation Reuse/Week/m ² (mm)	20
Irrigation Reuse/Day (kL/day)	6.00
Total Reuse (kL/day)	6.08

Table 4 – Humes JellyFish Parameters

Proprietary Filter Device
Humes Jellyfish-3000-14-4

3.2.3 Model Results

Water quality treatment train effectiveness for the total developed scenario is summarised in Table 5.

Table 5 – Mean Annual Load Reductions

Pollutant	Reduction Required (%)	Developed Unmitigated (kg/yr)	Developed Mitigated (kg/yr)	Resulting Reduction (%)
Total Suspended Solids (TSS)	80	3110	617	80
Total Phosphorus (TP)	60	5.70	2.25	61
Total Nitrogen (TN)	45	30.9	14.0	55
Gross Pollutants (GP)	90	307	9.76	97

Refer to Appendix B for the MUSIC output file results.

MUSIC results indicate that the pollutant load reductions for all water quality indicators have been achieved.

3.3 MAINTENANCE

3.3.1 Construction Phase

A detailed erosion & sediment control plan is to be prepared and implemented on site. Sediment fences and other preventative devices are to be installed. Entry and exit from the site are to be restricted to stabilised locations to minimise the risk of offsite transport of silt, sediment or mud. Any material imported to the site including construction materials are to be stockpiled in a location where it cannot contaminate the stormwater system or stormwater runoff.

Sediment basins, inlet protection, sediment fences and structural measures are to be checked daily during construction by the construction site supervisor. Inspections will help ensure the integrity of control structures and other structural measures.

Additional inspections will be required immediately following periods of heavy rain. Sediment build up is to be removed from behind the sediment fences and other barriers immediately after each major rainfall event.

3.3.2 Operational Phase

Once the site is fully developed all surface areas will be either sealed or landscaped. The amount of sediment likely to be generated by a mulched and watered landscape area is considered to be minimal.

Regular sweeping and removal can reduce the amount of dust and matter washed into the stormwater system from the hardstand areas.

No monitoring of water quality of the runoff from the site is proposed after construction is completed. Un-trialed stormwater quality management measures are not proposed.

Regular inspections of the stormwater system are to be carried out to ensure grates, pipes and stormwater quality treatment systems are functioning to its design intent.

A summary of maintenance requirements are as follows.

Rainwater Tank

Rainwater tanks must be maintained regularly to ensure good water quality and prevent mosquitoes breeding. Refer to Table 6 for a recommended maintenance program:

Table 6 – Rainwater Tank Maintenance Schedule

Regularity	Maintenance Action
3 months	Check and clean first flush device
6 months	Check structural integrity of the tank, including roof and access cover, mosquito-proof screens and flap valves for rips, holes and defects. Repair immediately.
6 months	Check roof and gutters for accumulated debris including leaf and other plant material. Remove all debris and prune overhanging tree branches and foliage.
6 months	Check for structural integrity and that all pipework connections remain secure.
6 months	Check for evidence of animal, bird or insect access. If present, identify and close access points.
2-3 years	Check inside the tank for accumulated sediment. If sludge is covering the bottom of the tank, siphon it out or completely empty the tank. Professional tank cleaners operate in many areas.

Refer to Appendix D for Humes Jellyfish maintenance requirements.

4.0 SITE FLOODING

4.1 REQUIRED BUILDING LEVEL

Brisbane City Council (BCC) FloodWise property reports and BCC City Plan Overlays indicate the site is subject to flooding from the storm tide, Brisbane River, and overland flow. Refer to Appendix C for the FloodWise property report. It is noted that the defined flood level source is set as Stormtide. As such the development must reach the required flood immunity levels as detailed in the BCC City Plan Coastal Hazard Overlay Code Table 8.2.6.3.C.

In accordance with the Building Code of Australia the development is classified as a Class 8. In accordance with the relevant BCC overlay codes the required minimum flood immunity levels for the building floor level, vehicular access and manoeuvring areas and the essential electrical services are set. Refer to Table 7 for the required minimum immunity level for each flooding source.

Table 7 – Required Flood Immunity Levels (Coastal Hazard Overlay – Storm Tide)

Development Type	River Minimum Flood Immunity Level Calculation (m AHD)	Required Minimum Flood Immunity Level (m AHD)
Building Floor Level	Category C = 3.1	3.1
Vehicular access and manoeuvring areas and unroofed carpark	Category D = 2% AEP level	2.2
Essential electrical services	Class 8 – Category C = 3.1	Class 7b – 3.1

As the subject site is subject to more than one flooding source, the minimum flood planning level is the highest level determined from each flooding source, Refer to Table 8 for the minimum flood level for this development.

Table 8 – Required Flood Immunity Levels

Development Type	Required Minimum Flood Immunity Level (m AHD)
Building Floor Level	3.1
Vehicular access and manoeuvring areas and unroofed carparks	2.2
Essential electrical services	3.1

Refer to Appendix A for Civil drawings and Appendix C for the BCC FloodWise Property Reports.

It is noted that the subject site is also subject to overland flow. Site levels within the southern portion of the site are required to be below the required 2.2mAHD for Vehicular manoeuvring areas and unroofed carparks. However these levels are driven to ensure that adequate conveyance of the overland flow is

possible. As such the proposed layout shows areas of hardstand less than the above 2.2mAHD. As this is due to the conveyance of overland flow, these levels are deemed acceptable. Refer to the below section for further discussion of the overland flow through the site.

4.2 OVERLAND FLOW

The proposed development is impacted from overland flow in three locations; Fison Avenue W, EagleView Place and the adjacent development.

4.2.1 FISON AVENUE W

The BCC City plan Overland Flow overlay indicates that an overland flow patch exists within the development site area. This overland flow traverses the site from Fison Avenue towards the Council drainage way. Refer to Figure 3 for the location of this overland flow path.

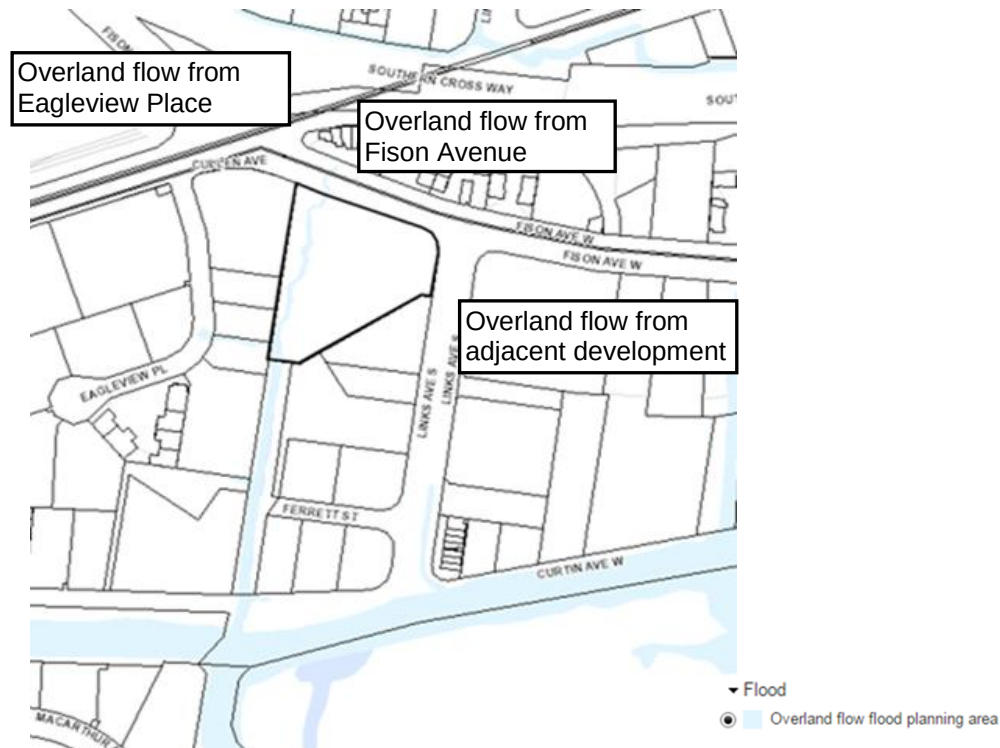


Figure 3 – BCC Overland Flow Flood Planning Area Overlay ePlan Mapping (Source - BCC)

According to topographical data this overland flow path receives an external catchment of approximately 4.8ha. Refer to Figure 4 for the external catchment layout and location where the overland flow enters the proposed development.

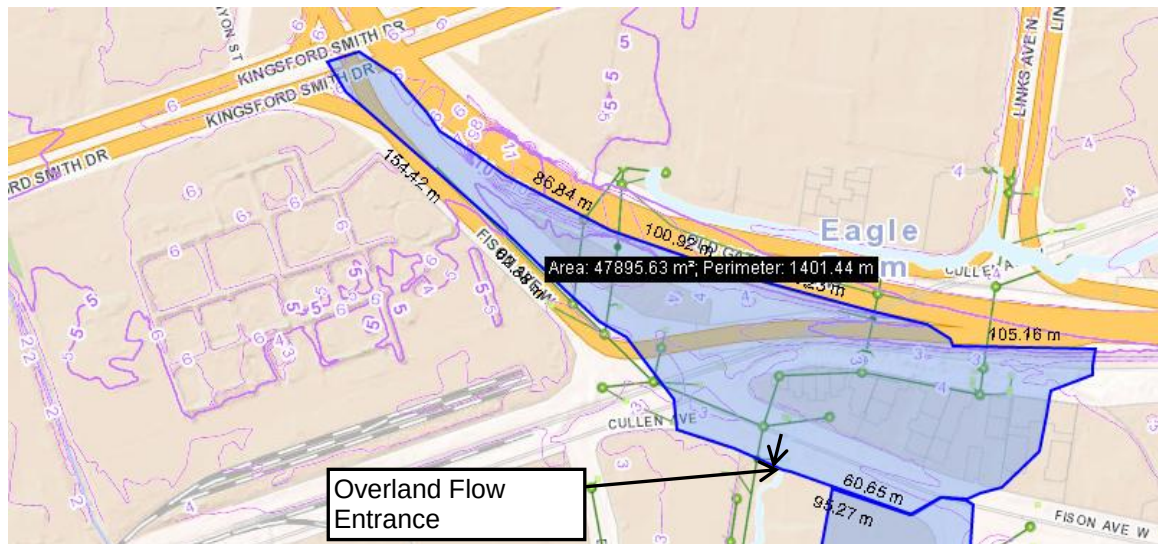


Figure 4 – External overland flow catchment area (Source – BCC Ebimap)

The proposed site also contributes to the overland flow as a result of the development. As such the total contributing catchment area to the overland flow path is 5.95ha. As there is an existing minor stormwater system located within the Fison Avenue Roadway and it is assumed that the system has adequate capacity. As such the flows contributing to the overland flow include the Major 50 Year ARI minus the minor 2 Year ARI Event is adequate. This flow has been calculated to be 1.92m³/s which will be required to traverse the proposed development.

It is proposed to cater for this overland flow via channelling the flows through the proposed hardstand area along the northern boundary and direct flows to the existing Council drainage easement.

Refer to Appendix A for the Civil Drawings and Appendix E for detailed calculations.

4.2.2 Eagleview Place

The BCC City plan Overland Flow overlay indicates that an additional overland flow patch exists within the development site area. This overland flow traverses the site from Fison Avenue towards the Council drainage way. Refer to Figure 3 for the location of this overland flow path.

According to topographical data this overland flow path receives an external catchment of approximately 4.4ha. Refer to Figure 5 for the external catchment layout and location where the overland flow enters the proposed development.

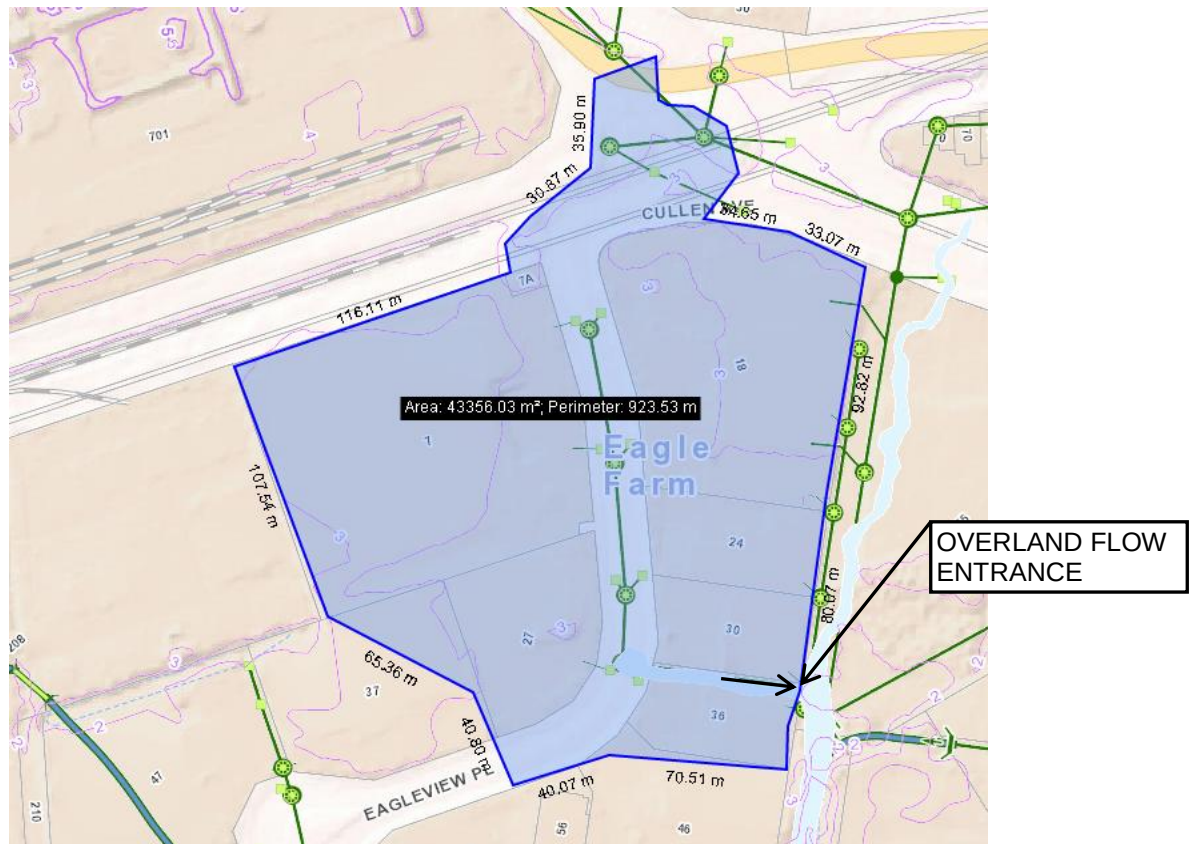


Figure 5 – External overland flow catchment area (Source – BCC Ebimap)

As there is an existing minor stormwater system located within the Eagleview Place it is assumed that the minor storm is able to enter this system. As such the flows contributing the overland flow include the Major 50 Year ARI minus the minor 2 Year ARI Event is acceptable.

The Fison Avenue Overland Flow and proposed development are also contributing to the overland flow which passes through this southern portion of the site. As such the total contributing catchment area to the overland flow path area when it enters the site is 10.5ha.

It is proposed to cater for this overland flow via channelling the flows through a proposed grassed swale zone towards the Council stormwater drain way. This flow has been calculated to be 3.12m³/s which will be required to traverse the grassed swale.

Refer to Appendix A for the Civil Drawings and Appendix B for the detailed calculations.

4.2.1 ADJACENT DEVELOPMENT

The existing site has an overland flow path and associated easement across the western property boundary. This flow path and associated easement was generated as part of the works associated with the existing warehouse building over the eastern portion of the site.

The existing warehouse has an existing Development Approval, which references can be found to a report by Whybird Farr Engineers, refer to Appendix F for details.

According to the Whybird Farr report it appears that this overland flow path traversing this portions of the site was originally intended to receive flow from a sizeable catchment upstream which is no longer valid since the construction of the Southern Cross Way (part of Gateway Duplication project) on an embankment. This has significantly reduced the external stormwater runoff catchment contributing to the overland flow via the western easement within the proposed site.

According to recent topographical data this overland flow path receives an external catchment of approximately 1.2ha. Refer to Figure 3 for the external catchment layout and location where the overland flow enters the proposed development.

Refer to Figure 6 for the external catchment layout and location where the overland flow enters the proposed development.

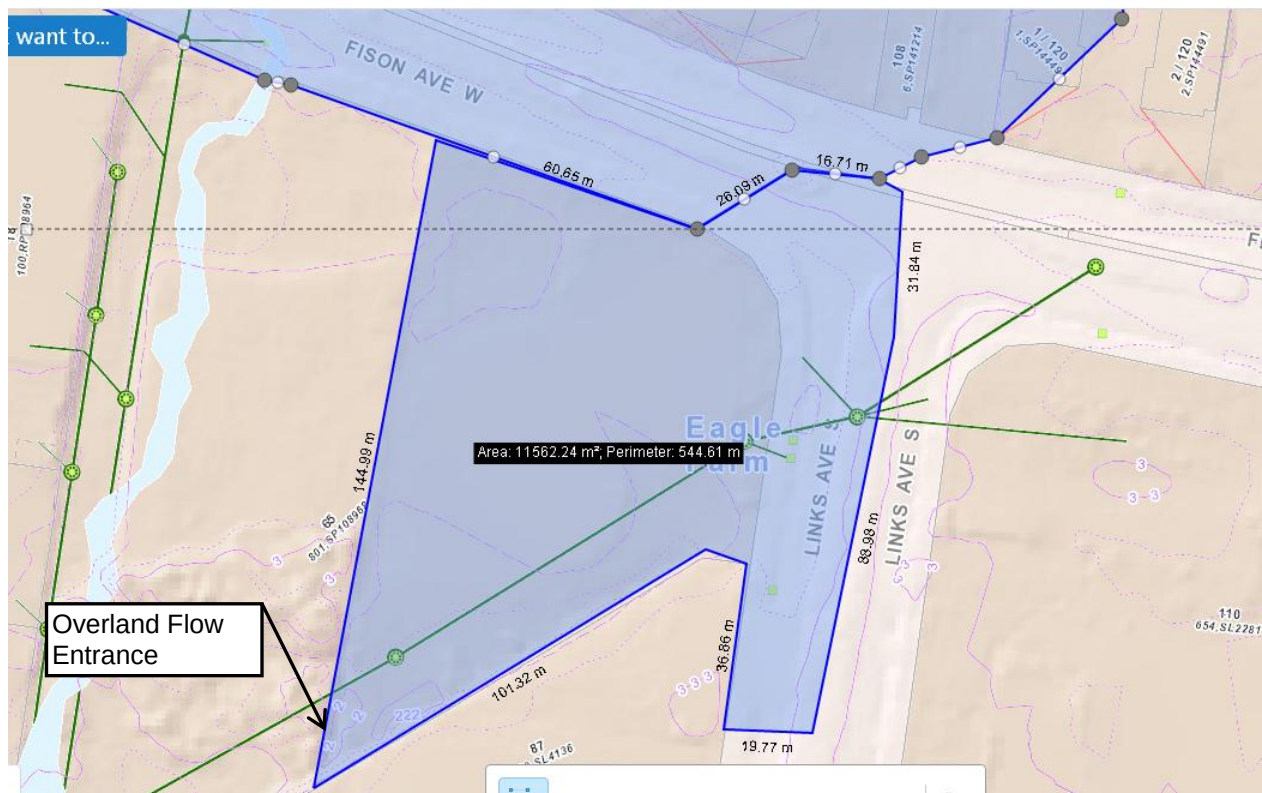


Figure 6 – External overland flow adjacent development contributing catchment area (Source – BCC Ebimap)

As there is an existing minor stormwater system located within the adjacent development and Links Ave S it is assumed that the minor storm is able to enter this system. As such the flow contributing to the overland flow include the Major 50 Year ARI minus the minor 2 Year ARI Event is acceptable.

It is proposed to cater for this overland flow via channelling the flows through the proposed development hardstand and a proposed concrete swale which can continue to direct flows to the Council stormwater drainway.

Refer to Appendix A for the Civil Drawings and Appendix B for the detailed calculations.

5.0 CONCLUSIONS

This report has been prepared to analyse the impacts of the proposed development on stormwater quality and quantity and to address Brisbane City Council guidelines regarding stormwater management.

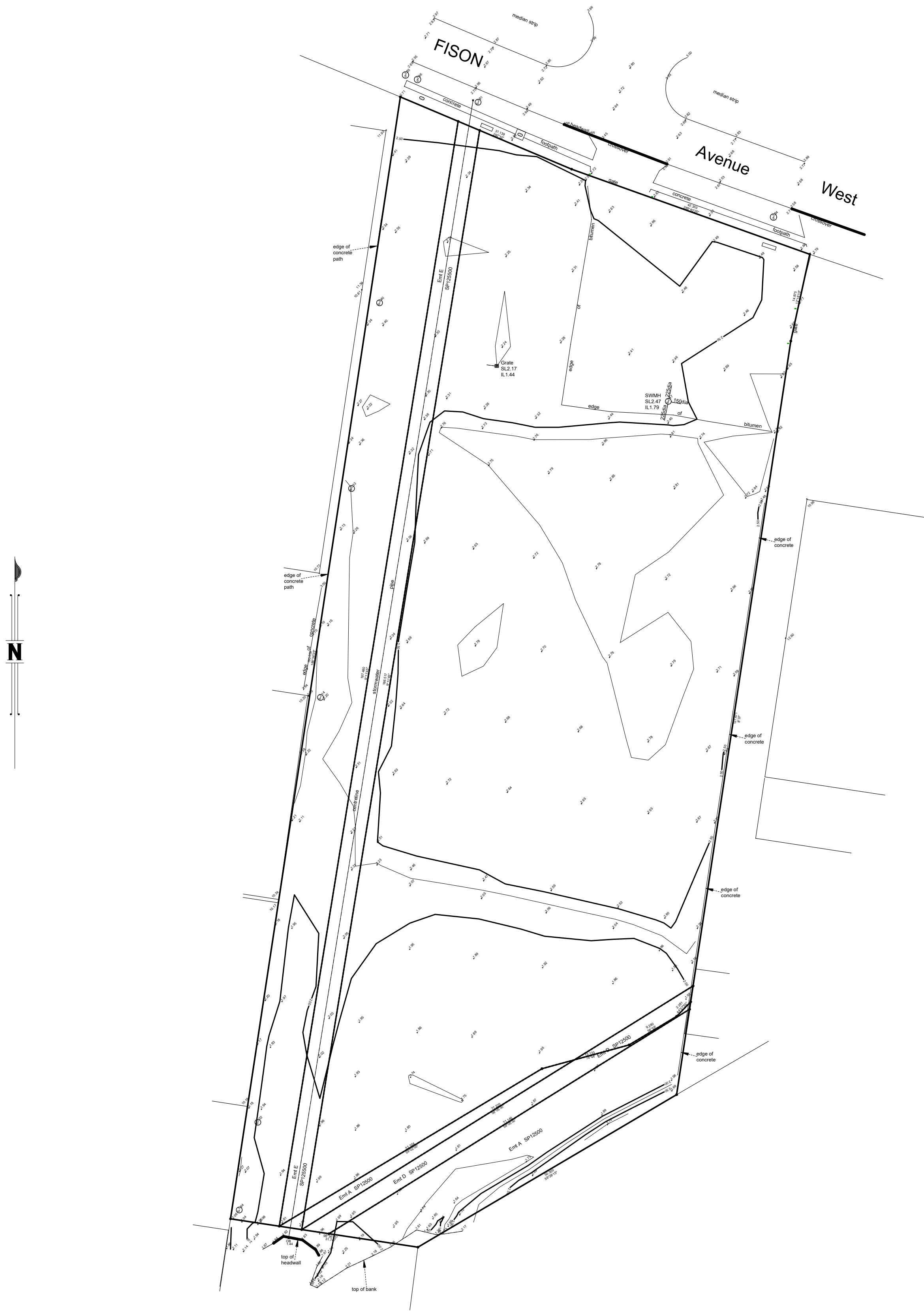
Stormwater quantity management has also been considered. An analysis of the receiving catchment has concluded that no onsite detention measures are required for the proposed development.

In order to ensure the proposed improvements do not adversely impact stormwater quality, rainwater tanks and proprietary filter devices are proposed.

In regards to the relevant sources of flooding, the required minimum flood immunity levels can be met and overland flows are able to be catered for through the site.

In summary, this report demonstrates that the proposed development, if constructed generally in accordance with the recommendations of this report would satisfy the requirements of Brisbane City Council guidelines with respect to stormwater management.

APPENDIX A – SITE SURVEY & CIVIL DRAWINGS



Scale 1:500 - Lengths are in Meters

Jon Baumann & Associates
licensed and engineering surveyors

3/28 Hillsdon Road
Taringa, QLD, 4068
Ph 33714899
email: office@jonb.com.au

TBM Temporary Bench Mark
OP Peg Found (not checked)
PB Power Box
PP Power Pole
LP Light Pole
TP Telstra Pit
WM Water Meter
FH Fire Hydrant
V Valve
SM Sewer Manhole
STM Stormwater Manhole
RM Roofwater Manhole

Gully Trap
Fence
Headwall
Retaining Wall
Kerb
Tree 0.45m dia @ 1.5m high
Shrub
Tree Stump
Stake

Notes:
Vertical Datum: AHD derived from GPS observations. Vertical accuracy is generally in the order of up to 20mm. If AHD levels are critical, this accuracy should be taken into account for design purposes.
The position of fence lines, retaining walls and other detail is indicative and should not be relied upon as depicting boundary lines. The location of corner pegs found have not been checked and as such should not be relied upon as marking the corners of the land. An Identification Survey should be carried out prior to any construction works.

Real Property Description:

Lease B in Lot 801 on SP108968

Parish of Toombul

County of Stanley

Metrodev

Plan of contours and detail at
107 Fison Avenue West
Eagle Farm

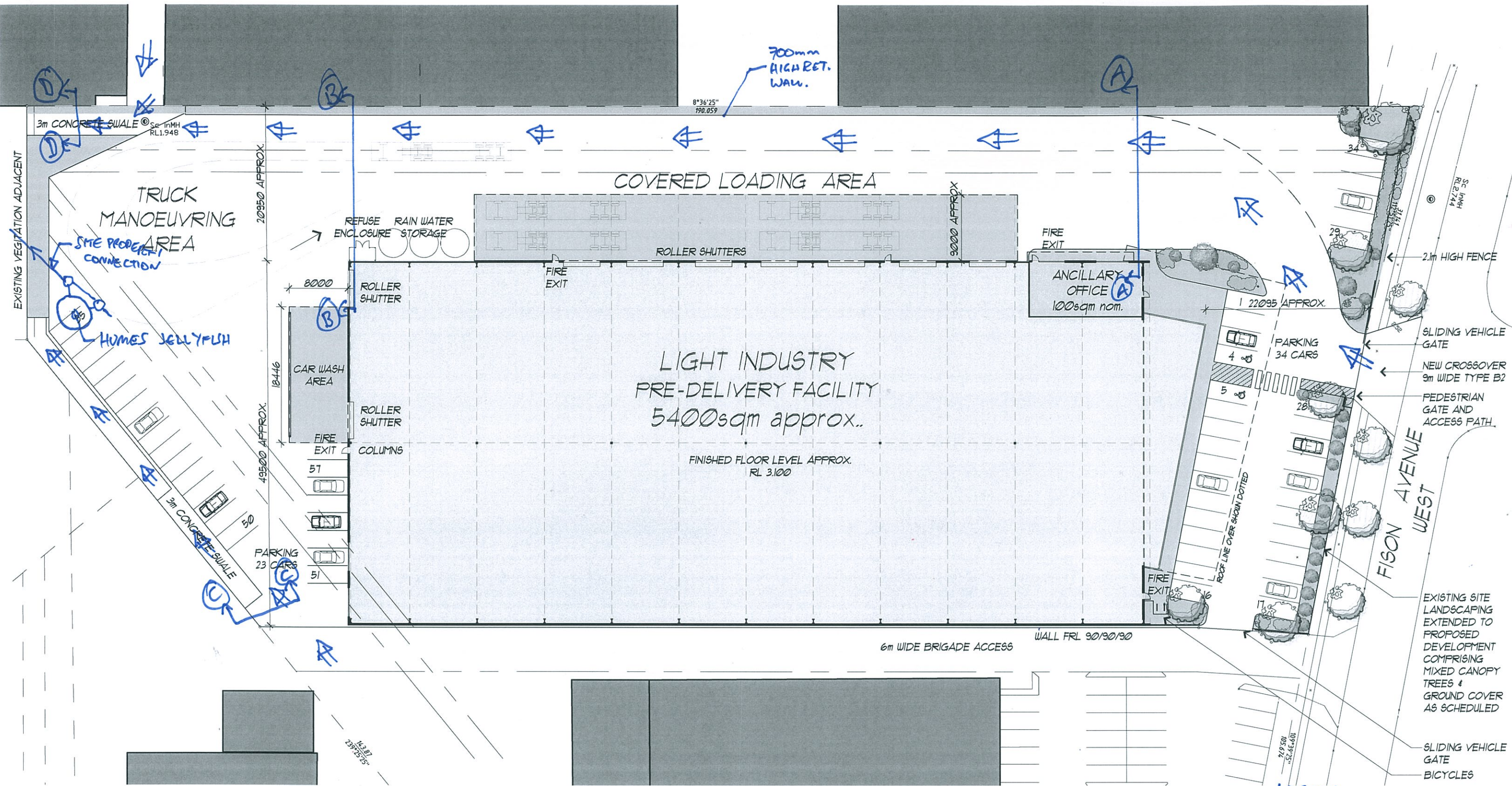
SCALE 1:500

Date: 27.11.15

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AMDT

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CONCEPT STORMWATER LAYOUT

McVeigh

18/12/15

McVeigh Consultants
PO Box 2401 Fortitude Valley Q 4006
65 Doggett Street Newstead Q 4006
Ph: (07) 3252 0688
Fax: (07) 3252 0711
mail@mcveigh.com.au
www.mcveigh.com.au

TO WESTERN BOUNDARY
ONTAGE
ONTAGE

DEVELOPMENT STATISTICS

PROPERTY DESCRIPTION	LEASE B IN LOT 801 ON SP108968 PARISH OF TOOMBUL COUNTY OF STANLEY	
SITE AREA	12,251sq m TOTAL	
GROSS FLOOR AREA	GROUND FLOOR:	5539 sq m
SITE COVERAGE	PROPOSED:	6798 sq m (55%)
PARKING	CARS: 57	BICYCLES: 4

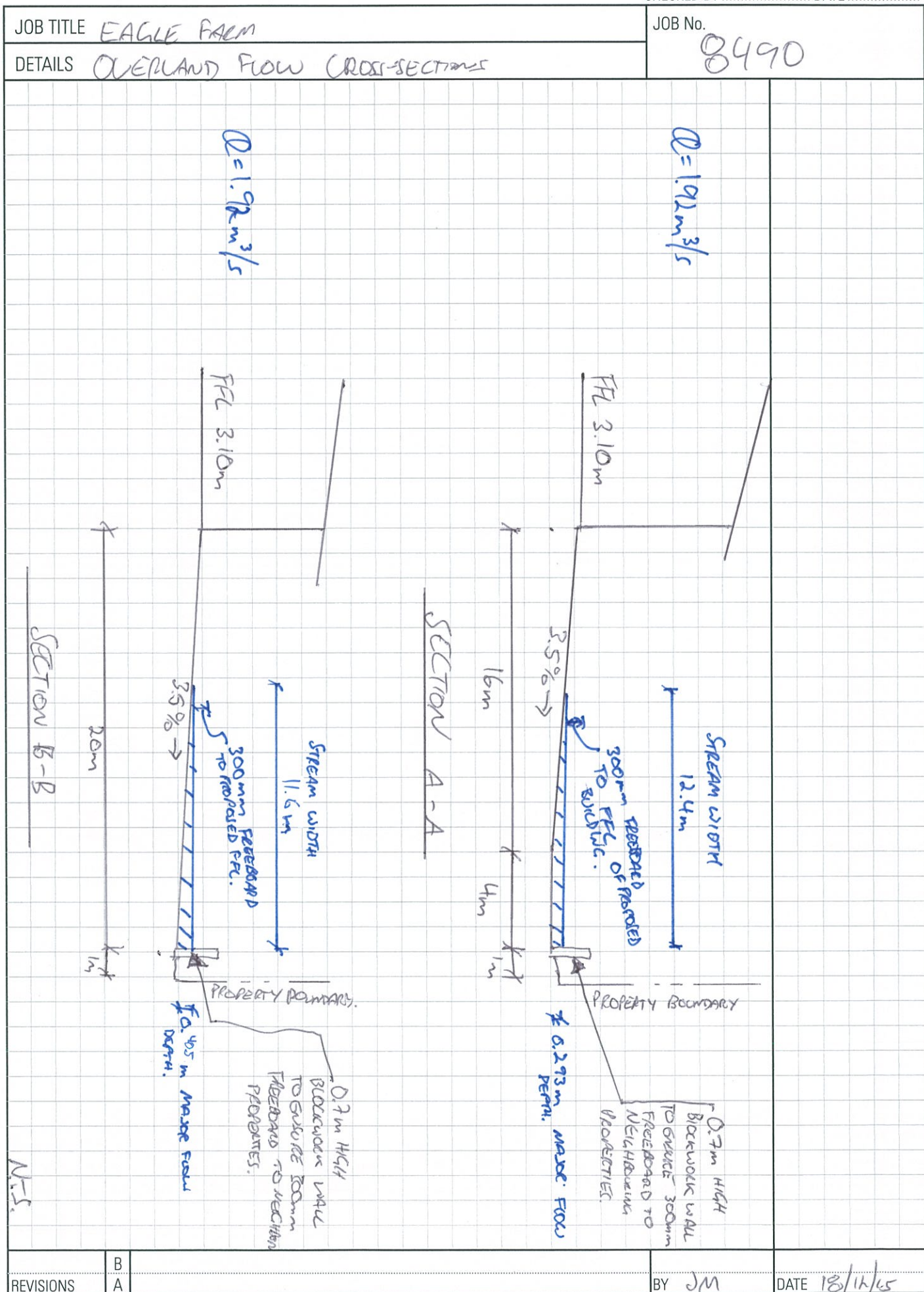
SITE PLAN

Job No. 417:35 Dwg. No. DA01 Rev. P1
Date: 23.11.15 Scale: 1:500 @A3
0' 5' 10' 15' 20' 25' 30m

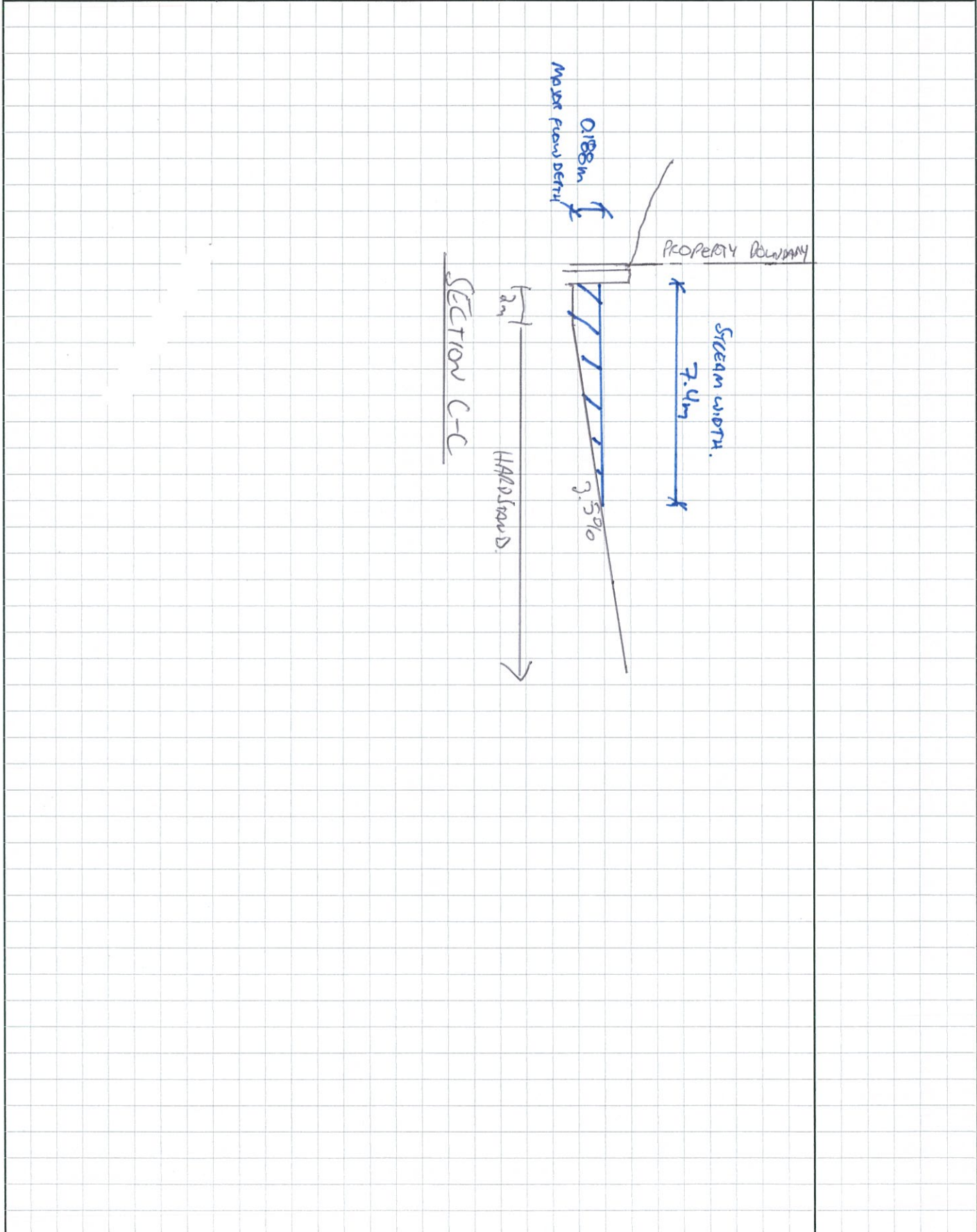
PRE-DELIVERY FACILITY

FISON AVENUE WEST,
EAGLE FARM

CECCATO HALL
+ ASSOCIATES
Architects



JOB TITLE	GAGE FARM	JOB No.	8490
DETAILS	OVERLAND FLOW CROSS SECTIONS.		



REVISIONS	B A	BY JM	DATE 18/12/15
-----------	--------	-------	---------------

JOB TITLE <u>GAGLE FARM</u>		JOB No. <u>8490</u>					
DETAILS <u>OVERLAND FLOW CROSS-SECTIONS.</u>							
The diagram shows a cross-section of a concrete structure, likely a weir or dam, with flow lines indicated by blue arrows. The structure is labeled 'CONCRETE SILLAGE'. A vertical dimension of '3.2m' is shown on the right side. A horizontal dimension of '0.36m' is shown at the top left, labeled 'MAJOR FLOW DEPTH TO OUTLET'. The structure is labeled 'SECTION D-D'.							
REVISIONS	<table border="1"> <tr> <td>B</td> <td></td> </tr> <tr> <td>A</td> <td></td> </tr> </table>	B		A		BY <u>JM</u>	DATE <u>18/12/15</u>
B							
A							

APPENDIX B – MUSIC RESULTS

Receiving Node

18/12/2015 10:00:10 AM

Treatment Train Effectiveness

	Flow (ML/yr)	TSS (kg/yr)	TP (kg/yr)	TN (kg/yr)	Gross Pollutants (kg/yr)
Sources	13.2	3.11E3	5.70	30.9	307
Residual Load	11.7	617	2.25	14.0	9.76
% Reduction	10.9	80.2	60.5	54.8	96.8

APPENDIX C – FLOODWISE PROPERTY REPORTS



Brisbane City Council FloodWise Property Report

Report Reference

1447634783207

16/11/2015 10:46:23

Dedicated to a better Brisbane

THIS REPORT IS FOR BUILDING AND DEVELOPMENT PURPOSES ONLY

The FloodWise Property Report provides property or lot-based flood information for building and development requirements. This report provides information on estimated flood levels, habitable floor level requirements and more technical information on the four sources of flooding: river, creek / waterway, storm tide and overland flow. Refer to the Useful Definitions section for a glossary of terms.

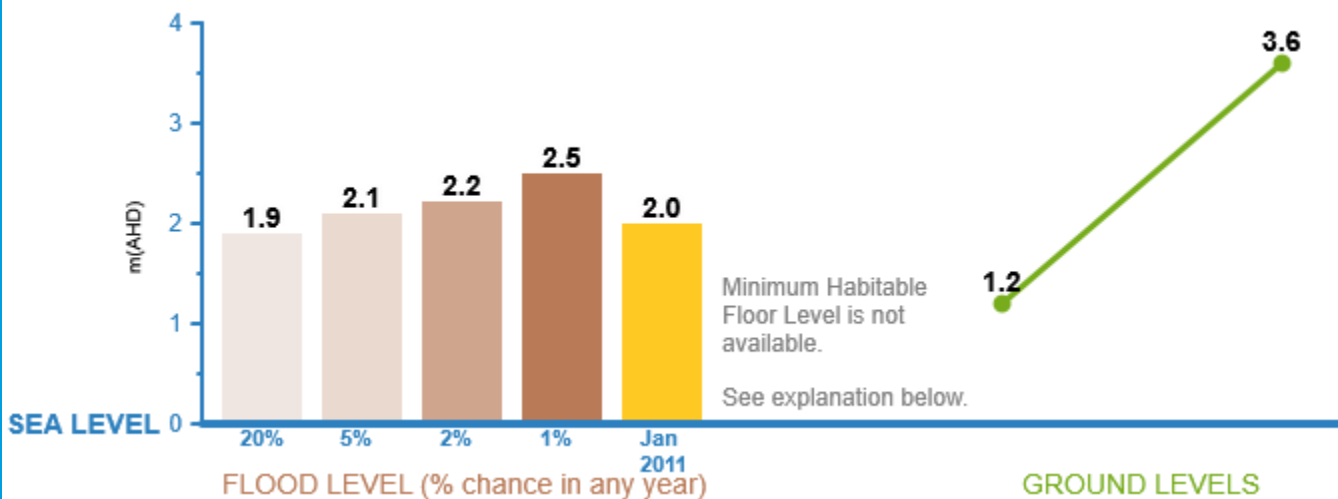
To find out more about how the contents of this report may affect building or development on this property, please visit www.brisbane.qld.gov.au/planning-building. For more general information about understanding your flood risk and how to prepare your property, family or business for potential flooding visit www.brisbane.qld.gov.au/beprepared

THIS IS A REPORT FOR:

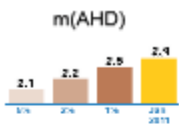
Rateable Address: 65 LINKS AVE, EAGLE FARM QLD 4009

Lot Details: L.801 SP.108968

FLOOD LEVEL INFORMATION



EXPLANATION



m(AHD) - Metres Australia Height Datum. The level of 0.0m AHD is approximately mean sea level.

Flood Levels - The Flood level bar chart above shows the possible flooding level and percentage chance of that level being reached or exceeded in any year. If an orange bar shows, it is the calculated January 2011 flood level at this address or lot.

Minimum Habitable Floor Level - Applies to residential development only. Please refer to Council's planning scheme to learn how this may affect you. If a property is in an overland flow path, or a large allotment, a minimum habitable floor level cannot be provided. Refer flood and planning development flags below.

Ground Levels - The green line above shows this property's approximate lowest and highest ground levels based on latest available information (2009 airborne laser survey) to Council. If you are building, please confirm with a surveyor.

For further information and definitions please refer to the Useful Definitions page

FLOOD AND PLANNING DEVELOPMENT FLAGS

DEVELOPMENT FLAG(S)

This property may also be affected by one or more flood or property development overlays or flags. These include: OVERLAND FLOW PATH, LARGE ALLOTMENT

Please review the technical summary over page and refer to Council's planning scheme for further information.



Brisbane City Council FloodWise Property Report

Report Reference

1447634783207

16/11/2015 10:46:23

Dedicated to a better Brisbane

TECHNICAL SUMMARY

This section of the FloodWise Property Report contains more detailed flood information for this property so surveyors, builders, certifiers, architects and engineers can plan and build in accordance with Council's planning scheme. For more information about building and development in Brisbane please visit www.brisbane.qld.gov.au/planning-building or talk to a Development Assessment Planning Information Officer via Council's Contact Centre on (07) 3403 8888.

THIS IS A REPORT FOR:

Rateable Address: 65 LINKS AVE, EAGLE FARM QLD 4009

Lot Details: L.801 SP.108968

PROPERTY INFORMATION (Summary)

The following table provides a summary of flood information for this property. More detailed flood level information is provided in the following sections of this report.

PROPERTY SUMMARY	LEVEL (mAHD)
Minimum Ground Level	1.2
Maximum Ground Level	3.6
Min Habitable Floor Level	Contact Council
Defined Flood Level (DFL)	2.5
Defined Flood Level Source	STORMTIDE
Flooding may also occur from	STORMTIDE,RIVER,OVERLAND FLOW

ESTIMATED PEAK FLOODING LEVELS

The table below displays the peak estimated flood levels by probability for this property. Estimated flood level data should be used in conjunction with applicable planning scheme requirements - Refer to Flood Planning Development Information.

Note that the overland flow flooding level maybe higher than the levels below from other sources.

DESCRIPTION	LEVEL (mAHD)	SOURCE
20% AEP	1.9	STORMTIDE
5% AEP	2.1	STORMTIDE
2% AEP	2.2	STORMTIDE
1% AEP	2.5	STORMTIDE
January 2011	2.0	RIVER
DFL	2.5	STORMTIDE

FLOOD PLANNING DEVELOPMENT INFORMATION

This section of the FloodWise Property Report contains information about Council's planning scheme overlays. Overlays identify areas within the planning scheme that reflect distinct themes that may include constrained land and/or areas sensitive to the effects of development.

FLOOD OVERLAY CODE

The Flood overlay code of Council's planning scheme uses the following information to provide guidelines when developing properties. The table below summarises the Flood Planning Areas (FPAs) that apply to this property. Development guidelines for the FPAs are explained in Council's planning scheme, which is available from www.brisbane.qld.gov.au/planning-building.

FLOOD PLANNING AREAS (FPA)		
RIVER	CREEK/WATERWAY	OVERLAND FLOW
FPA4		Applicable
FPA5		

COASTAL HAZARD OVERLAY CODE

The coastal hazard overlay code of Council's planning scheme uses the following information to provide guidelines when conducting new development. The table below summarises the coastal hazard categories that apply to this property. Development guidelines for the following coastal hazard overlay sub-categories are explained in the planning scheme, which is available from www.brisbane.qld.gov.au/planning-building.

COASTAL HAZARD OVERLAY SUB-CATEGORIES
Medium Storm Tide Inundation Area

NOTE: Where land is identified within one or more flood planning area on the Flood Overlay, or is identified within a Storm Tide Inundation area on the Coastal Hazard Overlay, the assessment criteria that provide the highest level of protection from any source of flooding applies.

PROPERTY DEVELOPMENT FLAGS

Overland Flow Path - Mapping indicates this property may be located within an overland flow path. Overland flow flooding usually occurs when the capacity of the underground piped drainage system is exceeded and/or when the overland flow path is blocked. It is recommended you consult a Registered Professional Engineer of Queensland to determine this property's habitable floor level and flooding depth. Please refer to Council's planning scheme for further information.

Large Allotment - This property is either a Large Allotment of over 1000 square metres or is located within a Large Allotment. Flood levels may vary significantly across allotments of this size. Further investigations may be warranted in determining the variation in flood levels and the minimum habitable floor level across the site. For more information or advice, it is recommended you engage a Registered Professional Engineer of Queensland.



Brisbane City Council FloodWise Property Report

Report Reference

1447634783207

16/11/2015 10:46:23

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Useful Definitions

Australian Height Datum (AHD) - The reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.

Annual Exceedance Probability (AEP) - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance.

Defined Flood Level (DFL) - The DFL for Brisbane River flooding is a level of 3.7m AHD at the Brisbane City Gauge based on a flow of 6,800 m³/s.

Maximum and Minimum Ground Level - Highest and lowest ground levels on the property based on available ground level information. A Registered Surveyor can confirm exact ground levels.

Minimum Habitable Floor Level - The minimum level in metres AHD at which habitable areas of development (generally including bedrooms, living rooms, kitchen, study, family and rumpus rooms) must be constructed.

Council's Planning Scheme - The City Plan (planning scheme) has been prepared in accordance with the Sustainable Planning Act as a framework for managing development in a way that advances the purpose of the Act. In seeking to achieve this purpose, the planning scheme sets out the Council's intention for future development in the planning scheme area, over the next 20 years.

Residential Flood Level (RFL) - Residential flood level (RFL) for Brisbane River flooding equates to the flood level applicable to the extent of January 2011 floods as depicted by mapping on the Queensland Reconstruction Authority website or the Council's defined flood level (DFL) for the Brisbane River, whichever is higher.

Rateable Address - A Lot or Property may have more than one street address. The address shown on this report is the address used by Council for the Lot or property selected.

Property - A property will contain 1 or more lots. The *Multiple Lot Warning* is shown if you have selected a property that contains multiple lots.

Brisbane City Council's Online Flood Tools

Council provides a number of online flood tools:

- to guide planning and development
- to help residents and businesses understand their flood risk and prepare for flooding.

Planning and Development Online Flood Tools

Council's online flood tools for planning and development purposes include:

- FloodWise Property Report
- Flood Overlay Code

For more information on Council's planning scheme and online flood tools for planning and development:

- phone 07 3403 8888 to talk to a Development Assessment Customer Liaison Officer
- visit www.brisbane.qld.gov.au/planning-building
- visit a Regional Business Centre.

Helping residents and businesses be prepared for flooding

Council has a range of free tools and information to help residents and businesses understand potential flood risks and how to be prepared. This includes:

- Flood Awareness Maps
- Flooding in Brisbane – A Guide for Residents
- Flooding in Brisbane – A Guide for Business
- Early Warning Alert Service. Visit www.brisbane.qld.gov.au/earlywarning to register for email, home phone or SMS severe weather alert updates.

Note: The Flood Awareness Maps show four levels of flood risk from high risk (flooding is very likely to occur) through to very low risk (very rare and extreme flood events). Flooding in the low and very low risk areas has no planning and development requirements and is therefore not reflected in the FloodWise Property Report.

For more information on Council's online flood tools for residents and business:

- Visit www.brisbane.qld.gov.au/beprepared
- Phone (07) 3403 8888.



Brisbane City Council FloodWise Property Report

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Disclaimer

1. Defined Flood Levels and Residential Flood Levels, and the Minimum Habitable Floor Levels are determined from the best available information to Council at the date of issue. These flood levels, for a particular property, may change if more detailed information becomes available or changes are made in the method of calculating flood levels.
2. Council makes no warranty or representation regarding the accuracy or completeness of a FloodWise Property report. Council disclaims any responsibility or liability in relation to the use or reliance by any person on a FloodWise Property Report.



Planning to build or renovate?

For information, guidelines, tools and resources to help you track, plan or apply for your development visit www.brisbane.qld.gov.au/planning-building

You can also find the Brisbane City Plan 2014 and Neighbourhood Plans as well as other information and training videos to help with your building and development plans.

APPENDIX D - HUMES JELLYFISH MAINTENANCE REQUIREMENTS

JellyFish[®] filter Inspection and maintenance guide

Issue 1



Inspection and maintenance overview

The primary purpose of the JellyFish® filter is to remove pollutants from stormwater runoff. As with any filtration system, periodically these pollutants must be removed to restore the JellyFish® filter to maximum treatment performance. Regular inspection and maintenance are required to ensure proper functioning of the system.

Maintenance requirements and frequency are dependent on the specific pollutant loading characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Inspection of the JellyFish® filter is typically performed from the surface, while proper maintenance requires a combination of procedures conducted from the surface and with worker entry into the structure. Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of sediment
- Rinsing and re-commissioning of filter cartridges
- Replacement of spent or damaged filter cartridge tentacles

The JellyFish® filter is inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. Since some of the maintenance procedures require manned entry into the Jellyfish structure, only professional maintenance service providers trained in confined space entry procedures should enter the vessel.

Certain safety and damage prevention precautions, included in these guidelines, should be reviewed and observed during all inspection and maintenance activities.

Please refer to the following information and guidelines prior to conducting inspection and maintenance activities.

Inspection timing

Inspection of the JellyFish® filter is important to determine the maintenance requirement and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below:

- Post-construction inspection is required prior to putting the JellyFish® filter into service. Any construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired, prior to commissioning.
- A minimum of two inspections are recommended during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system. Ideally, at least one inspection should be performed during wet weather to observe flow characteristics and relative water elevations within the system.
- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation, but generally should be performed at least once per year.
- Inspection is recommended after major storm events.
- Inspection must be performed immediately after an oil, fuel or other chemical spill.

Inspection tools and equipment

The following equipment and tools are typically required when performing a JellyFish® filter inspection:

- Manhole access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Inspection procedure

The JellyFish® filter is typically inspected from the surface. The following procedure is generally recommended when performing inspection:

- Place safety cones and caution tape around the inspection area as required. Redirect vehicle traffic if necessary.
- Open all covers and hatches to provide maximum ventilation and light into the structure.
- Determine sediment depth by inserting a sediment probe through the maintenance access wall (MAW) opening. Lower the probe through the water column and carefully push through the accumulated sediment in the sump until contact is made with the floor of the structure. Retrieve the probe, measure sediment depth, and repeat in multiple locations within the MAW opening. Note the range of sediment depths and any oil layer present. Sediment depth of 300 mm or greater indicates the need for maintenance removal of accumulated sediment and rinsing of the filter cartridges.
- Inspect for floatable pollutants such as trash, debris, and oil sheen by shining a flashlight into the MAW opening. Oil depth may be determined by using the sediment probe.
- Inspect the cartridge deck to ensure that all cartridge lids are intact. If a cartridge lid is missing and a cartridge receptacle ring exposed, replacement of the cartridge lid is required.
- Inspect the MAW, cartridge deck, backwash pool weir, and pressure relief pipe(s) (on-line units only) for any obvious damage such as cracked or broken components. If damage is present, repair is required.
- In a dry weather inspection, inspect the cartridge deck for standing water. Normally, there will be no standing water on the deck in dry weather.
- If standing water is present on the portion of the deck that is outside the backwash pool, it may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- If standing water is present on the deck inside the backwash pool but not outside the backwash pool, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed.
- In a wet weather inspection, observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
- If the water depth within the MAW is less than 150 mm, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- If the water depth within the MAW is greater than 150 mm, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- If the water depth within the MAW is 450 mm or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed.

Maintenance requirement

The required maintenance for the JellyFish® filter is based upon results of the most recent inspection and historical maintenance requirements for the specific site. In general, the required maintenance will require some combination of the following maintenance activities:

- Sediment must be cleaned out of the unit once the sediment depth reaches 300 mm of accumulation, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
- Floatable trash, debris, and oil must be removed at the time of sediment cleaning and at the time of filter cartridge rinsing.
- Filter cartridges must be rinsed and re-commissioned as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
- Filter cartridge tentacles must be replaced if filter cartridge rinsing does not sufficiently removed accumulated sediment from the tentacles, or if tentacles are damaged (i.e. tentacle membrane is cut or torn, tentacle is broken, or tentacle end cap pipe threads are damaged) or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
- Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
- The unit must be cleaned out and filter cartridges inspected immediately after an oil, fuel or chemical spill. Filter cartridge tentacles should be replaced if damaged by the spill.

Maintenance tools and equipment

The following equipment and tools are typically required when performing JellyFish® filter maintenance:

- Vacuum truck
- Ladder
- Garden hose and low pressure sprayer
- Rope or cord to lift filter cartridges from the cartridge deck to the surface
- Adjustable pliers for removing filter cartridge tentacles from cartridge head plate
- Plastic tub or garbage can for collecting dirty water from rinsed filter cartridge tentacles
- Manhole access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Proper safety equipment for confined space entry
- Replacement filter cartridge tentacles if required

Maintenance procedure

The following procedures are generally recommended when maintaining the JellyFish® filter:

- Place safety cones and caution tape around the maintenance area as required. Redirect vehicle traffic if necessary.
- Open all covers and hatches to provide maximum ventilation and light into the structure. Use ventilation equipment if required according to confined space entry procedures. *Caution* – Do not drop any objects onto the cartridge deck or components, as damage may result.
- Follow the inspection procedure if no recent inspection was performed prior to maintenance activity.
- To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. *Caution* – Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.

Filter cartridge rinsing procedure

1. Remove a cartridge lid by grasping each ear of the lid and rotating counter-clockwise.
2. Slowly and carefully remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. *Caution* – Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and remove the cartridge.
3. Thread a rope or cord through the lifting loops and lift the filter cartridge from the cartridge deck to the top surface outside the structure. *Caution* – Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle at a time.
4. Repeat the filter cartridge removal procedure until all of the cartridges are located at the top surface outside the structure.
5. Disassemble the tentacles from each filter cartridge by using pliers to grasp the attachment nuts and rotating counter-clockwise. Remove the tentacles from the cartridge head plate. Place the attachment nuts and O-rings into a separate container to be used later for reassembly.
6. Position a receptacle in a plastic tub or garbage can such that the dirty rinse water is captured. Using a

low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rotate the tentacle and continue the rinsing until all sediment is removed from the membrane. *Caution* – Do not use a high pressure sprayer or focused stream of water on the membrane, as excessive water pressure may result in damage to the membrane.

7. Set the rinsed tentacles aside until there are enough to reassemble a complete cartridge. *Caution* – Do not bend or drop a tentacle or impact the pipe nipple on the top end of a tentacle, as this may result in damage to the tentacle and prevent reassembly.
8. Remove dirty rinse water from the rinse tub or garbage using the vacuum hose as needed.
9. Slip the O-ring over the pipe nipple on the top end of the tentacle and reassemble onto the cartridge head plate. Attachment nuts should be assembled firmly hand-tight. Do not over-tighten.
10. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Humes to order replacement tentacles.
11. Lower a rinsed filter cartridge to the cartridge deck. Remove the cartridge lid on a receptacle and carefully lower the filter cartridge into the receptacle until the head plate gasket is seated squarely on the lip of the receptacle. *Caution* – Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward, as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.
12. To refit the cartridge lid, first rinse away any accumulated grit from the receptacle threads if needed to get a proper fit. Replace the cartridge lid on the exposed receptacle by grasping the ears of the lid and rotating clockwise, ensuring that the cartridge lid male threads align with the cartridge receptacle female threads. Once hand tight, firmly turn the cartridge lid a further 110 degrees clockwise (minimum) to seat the filter cartridge in place and provide a proper watertight seal.
13. Repeat cartridge installation one at a time until all cartridges are installed.

Vacuum cleaning procedure

- *Caution* – Perform vacuum cleaning of the JellyFish® filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
- To remove floatable trash, debris, and oil, lower the vacuum hose into the MAW opening and vacuum floatable pollutants off the surface of the water. Alternatively, floatable solids may be removed by a net or skimmer.
- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank.
- Remove the sediment from the bottom of the unit through the MAW opening.
- For larger diameter JellyFish® filter manholes (2.4 m, 3.0 m, 3.6 m), complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.
- After the unit is clean re-install the filter cartridges.
- Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

Chemical spills

Caution – If a chemical spill has been captured by the JellyFish® filter, do not attempt maintenance. Immediately contact the local hazard response agency, and contact Humes.

Figure 1 – JellyFish® filter components

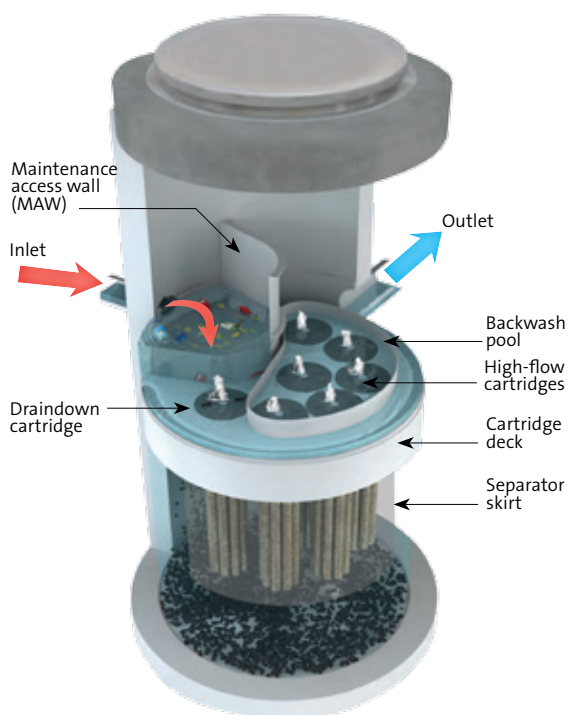
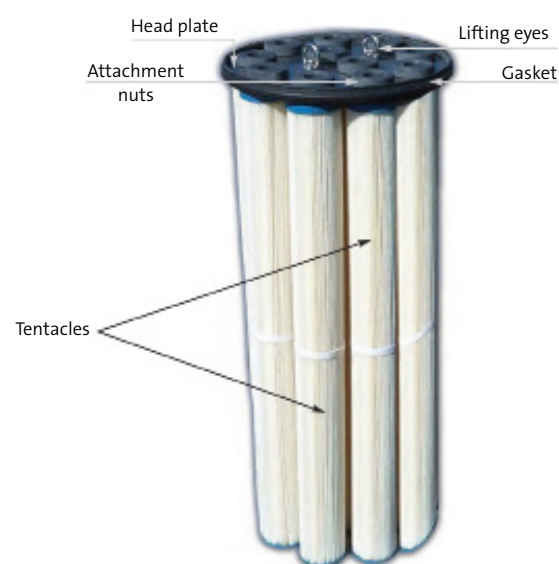


Figure 2 – JellyFish® membrane filtration cartridge





A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and floatables.



Vacuum wand inserted through the maintenance access wall opening.



A view of the cartridge deck from the surface showing all the cartridge lids intact and no standing water on the deck.



Inspection of the flexible separator skirt from inside the maintenance access wall opening.



Rinsing the dirty cartridge tentacles with a low-pressure garden hose, and using a garbage bin to capture the run-off



Installation of a filter cartridge into a cartridge receptacle in the deck.

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APPENDIX E – STOMRWATER QUANTITY CALCULATIONS

Rational Method Calculations - Brisbane

Site: **Eagle Farm**

Catchment Conditions:	Fison Avenue W
Number of Sub-Catchments:	2
Location of Discharge Point:	South

Sub-Catchments	1	Site	3	4	Total	
Areas	4.8	1.2			6	ha
C ₁₀ Runoff Coefficients	0.88	0.88	0.00	0.00		

Time of Concentration	
Standard inlet time (upper catchment slope)	%
Standard inlet time	17 min
Adopted Time of Concentration	17 min

ARI (years)	Rainfall Intensity (mm/hr)	F _y (QUDM Table 4.05.2)	Runoff Coefficients				Discharges (m ³ /s)				
			1	Site	3	4	1	Site	3	4	Total
0.25	-	-	-	-	-	-	-	-	-	-	0.417
1	71	0.80	0.70	0.70	-	-	0.666	0.167	-	-	0.833
2	92	0.85	0.75	0.75	-	-	0.918	0.229	-	-	1.147
5	118	0.95	0.84	0.84	-	-	1.315	0.329	-	-	1.644
10	134	1.00	0.88	0.88	-	-	1.572	0.393	-	-	1.965
20	156	1.05	0.92	0.92	-	-	1.922	0.480	-	-	2.402
50	184	1.15	1.00	1.00	-	-	2.453	0.613	-	-	3.067
100	206	1.20	1.00	1.00	-	-	2.747	0.687	-	-	3.433

Total Overland Flow = 1.920m³/s

Project Name

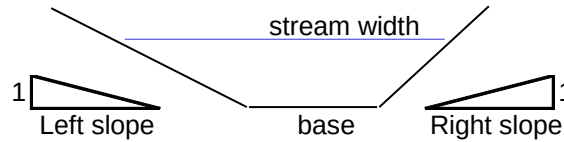
Section A

Channel flow calculations

Determination of depth of flow for given channel

Channel details

Manning's Coefficient	0.013	
Slope	1 vertical :	horizontal
	or	0.1 %
Base width	4.00	m
Right side slope	1:	0.0001 Wall
Left side slope	1:	28.6 3.50%

**Calculation**

	Flow based	
Return period ARI	100	
Assumed start depth	0.400	m
Required flow	1.920	m ³ /s
Required velocity		m/s
Depth	0.293	m
Actual Flow	1.920	m ³ /s
Actual Velocity	0.801	m/s
Stream width	12.371	m
Froude No	0.473	
	streaming	
Depth x Velocity	0.235	m ² /s

Project Name

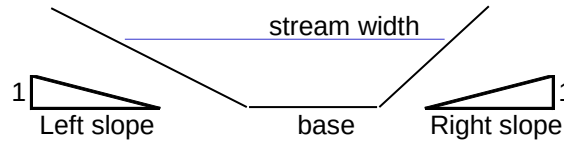
Seciton B

Channel flow calculations

Determination of depth of flow for given channel

Channel details

Manning's Coefficient	0.013	
Slope	1 vertical :	horizontal
	or	0.1 %
Base width	0.00	m
Right side slope	1:	0.0001 Wall
Left side slope	1:	28.6 3.50%

**Calculation**

	Flow based
Return period ARI	100
Assumed start depth	0.500 m
Required flow	1.920 m ³ /s
Required velocity	m/s
Depth	0.405 m
Actual Flow	1.920 m ³ /s
Actual Velocity	0.819 m/s
Stream width	11.578 m
Froude No	0.411
	streaming
Depth x Velocity	0.332 m ² /s

Rational Method Calculations - Brisbane

Site: Eagle Farm

Catchment Conditions:	Adjacent Development
Number of Sub-Catchments:	1
Location of Discharge Point:	South

Sub-Catchments	1	2	3	4	Total	
Areas	1.2				1.2	ha
C ₁₀ Runoff Coefficients	0.88	0.00	0.00	0.00		

Time of Concentration	
Standard inlet time (upper catchment slope)	%
Standard inlet time	8 min
Adopted Time of Concentration	8 min

ARI (years)	Rainfall Intensity (mm/hr)	F _y (QUDM Table 4.05.2)	Runoff Coefficients				Discharges (m ³ /s)				
			1	2	3	4	1	2	3	4	Total
0.25	-	-	-	-	-	-	-	-	-	-	0.115
1	98	0.80	0.70	-	-	-	0.230	-	-	-	0.230
2	126	0.85	0.75	-	-	-	0.314	-	-	-	0.314
5	161	0.95	0.84	-	-	-	0.449	-	-	-	0.449
10	181	1.00	0.88	-	-	-	0.531	-	-	-	0.531
20	209	1.05	0.92	-	-	-	0.644	-	-	-	0.644
50	246	1.15	1.00	-	-	-	0.820	-	-	-	0.820
100	274	1.20	1.00	-	-	-	0.913	-	-	-	0.913

Total Overland Flow = 0.506m³/s

Project Name

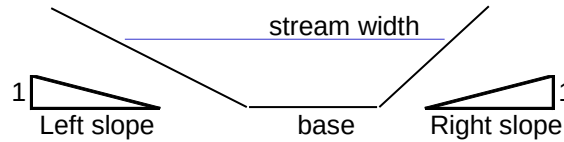
Seciton C

Channel flow calculations

Determination of depth of flow for given channel

Channel details

Manning's Coefficient	0.013	
Slope	1 vertical :	horizontal
	or	0.1 %
Base width	2.00	m
Right side slope	1:	28.7 3.48%
Left side slope	1:	0.001 Wall

**Calculation**

	Flow based	
Return period ARI	100	
Assumed start depth	0.200	m
Required flow	0.510	m ³ /s
Required velocity		m/s
Depth	0.188	m
Actual Flow	0.510	m ³ /s
Actual Velocity	0.579	m/s
Stream width	7.385	m
Froude No	0.427	
	streaming	
Depth x Velocity	0.109	m ² /s

Rational Method Calculations - Brisbane

Site: **Eagle Farm**

Catchment Conditions:	EagleView Place + Site + Fison Avenue W
Number of Sub-Catchments:	3
Location of Discharge Point:	South

Sub-Catchments	1	Site	3	4	Total	
Areas	4.8	1.15	4.4		10.35	ha
C ₁₀ Runoff Coefficients	0.88	0.88	0.88	0.00		

Time of Concentration	
Standard inlet time (upper catchment slope)	%
Standard inlet time	20 min
Adopted Time of Concentration	20 min

ARI (years)	Rainfall Intensity (mm/hr)	F _y (QUDM Table 4.05.2)	Runoff Coefficients				Discharges (m ³ /s)				
			1	Site	3	4	1	Site	3	4	Total
0.25	-	-	-	-	-	-	-	-	-	-	0.668
1	66	0.80	0.70	0.70	0.70	-	0.620	0.148	0.568	-	1.336
2	85	0.85	0.75	0.75	0.75	-	0.848	0.203	0.777	-	1.828
5	110	0.95	0.84	0.84	0.84	-	1.226	0.294	1.124	-	2.644
10	125	1.00	0.88	0.88	0.88	-	1.467	0.351	1.344	-	3.163
20	145	1.05	0.92	0.92	0.92	-	1.786	0.428	1.638	-	3.852
50	172	1.15	1.00	1.00	1.00	-	2.293	0.549	2.102	-	4.945
100	193	1.20	1.00	1.00	1.00	-	2.573	0.617	2.359	-	5.549

Total Overland Flow = 3.12m³/s

Project Name Seciton D

Channel flow calculations

Determination of depth of flow for given channel

Channel details			
Manning's Coefficient	0.013		
Slope	1 vertical :	horizontal	
	or	1 %	
Base width	2.00	m	
Right side slope	1:	2	50.00%
Left side slope	1:	2	50.00%
Calculation Flow based Return period ARI Assumed start depth Required flow Required velocity Depth Actual Flow Actual Velocity Stream width Froude No Depth x Velocity			
	100		
	0.200	m	
	3.120	m ³ /s	
		m/s	
	0.358	m	
	3.120	m ³ /s	
	3.212	m/s	
	3.431	m	
	1.715		
	shooting		
	1.149	m ² /s	

APPENDIX F – WHYBIRD FARR REPORT

Whybird Farr Engineers

STRUCTURAL AND CIVIL CONSULTANTS

99.118

23 September, 1999

Urban Strategies
7/17 Peel St.
SOUTH BRISBANE 4101

Attention: Mr. Cameron Stanley

Dear Sir,

Re: Nafu Pty. Ltd.- 65 links Av. South Eagle Farm

Please find enclosed one bound and one unbound copy of our report relating to Council's Information request and Overland Flow issues relating to the above development.

Please contact the undersigned if any further information is required.

Yours Sincerely
Whybird Farr Engineers



A.C. Farr

cc. Carl Brunskill
Nafu Pty. Ltd. Steve Vedelago

99.118

PREMISES FOR A.E.SMITH

65 LINKS AV. SOUTH EAGLE FARM.

CLIENT: Nafu Pty. Ltd.

ARCHITECT: Carl Brunskill Architects

**Preliminary Assessment Of The Impact On The Existing
Stormwater Drainage System Of A Redevelopment to Site at
65 Links Av. South Eagle Farm.**

**WHYBIRD FARR ENGINEERS
25 Mein St.
SPRING HILL 4000**

12 January, 1999

1.0 PREAMBLE

Nafru Pty. Ltd. has engaged Whybird Farr Engineers to undertake a preliminary assessment of the impact on the existing Council stormwater drainage systems and the on site stormwater management of a redevelopment to the site at 65 Links Av. South Eagle Farm. This report addresses issues raised in Council's Information Request dated 1 September 1999.

2.0 DATA SOURCES

The following data has been collected and/or scrutinised:

1. Orthophoto Maps.
2. Existing Plans (As - Constructed) of the existing stormwater system.
3. Bimap information.

Enclosed are the following:

1. Calculations for the analysis of the catchments.
2. Dwg 99.118 Sk 01 showing the site plan, existing contours, catchments and Stormwater outlets, along with sections at critical sections and proposed filling levels.

3.0 COMMENTARY ON INFORMATION REQUEST

The comments below relate in point order to those raised in the information request.

- We have researched title ownership of the drain at the southern corner of the site. It would appear that no RP applies currently to the strip of land in which the drain runs, and so it would appear to be Crown land. Currently, the drain is used as the lawful point of discharge for the Eagleview Industrial Estate, and also has a Council stormwater pipe that runs along the west boundary of the subject site discharging into it. We consider that the drain notwithstanding the ambiguity of it's title represents our lawful point of discharge.
- We have had verbal discussions with Council's Mr. Stuart Piper with regards the allotment filling level. In accordance with the *BCC Subdivision and Development Guidelines* table B2.2(1) we believe that the minimum allotment level of RL 2.5m AHD applies in this case. SK01 shows proposed final levels for the building and external areas. Along the southern boundary, this criteria will need to be relaxed on the external pavements for reasons of passage of the overland flows generated from upstream catchments. This issue is addressed further in later sections.

The current site development comprises a largely fully paved surface, and it is not considered that the proposed development will increase or materially change the current times of concentration or total quantity of stormwater flows. Hence it is assessed that there will be little net change to the downstream effect as a result of the proposed development.

- Refer revised architectural drawings.
- The number of access points is being considered separately in a traffic report.
- SK01 shows details of the general scheme to provide stormwater quality management using Stormceptors on all drainage emanating from paved areas. These details will be incorporated in the final Civil design drawings, and will comply with the Council guidelines.
- .Refer other supporting information.
- Refer revised Architectural drawings.
- This area has a significant overland flow passing through it from upstream catchments, and will be subject to overland flow easements. It is considered that landscaping treatments will not assist resolving the issues in this area. Refer the following section for further discussion on the proposed methods for transmitting the overland flow.

4.0 OVERLAND FLOW ISSUES

We have shown on SK01 details to provide for overland flows that currently occur over the site. Provided on that drawing is the assumed catchment plan for these flows, and sections at critical sections of the overland flow around the proposed site development.

Calculations to support the details are included in appendix A.

Existing site and downstream drainage details extracted from Council records are included in Appendix B.

Based on the data available and the calculations carried out, sufficient outlet capacity is available to handle a 1 in 50 year event for flows emanating from upstream catchments. At the constriction point on the south-east corner of the proposed building, a reduction in the available flow width results in an increase in the velocity multiplied by depth ratio above the Councils recommended maximum of 0.6. However, we believe that this effect is ameliorated by reason of the following:

- The area is not subject to public access..
- The area is in fact little used by pedestrians.
- The increased velocity occurs on the boundary by nature of the triangular shape of the flow cross-section, away from pedestrian usage area.

- Further downstream, the use of a broad crested weir with an acceptable $V \times D$ ratio would mean that for a person swept off their feet at the constriction, they would be able to safely regain their feet well before any prospect of being swept into the drain occurred.

Due to the upstream pre-existing site levels, to achieve adequate falls through the site for overland flows, it is necessary that the levels of the site subject to overland flow are below the minimum RL2.5m AHD minimum allotment filling level. We do not feel that this can be avoided, without causing disruption to the overland flow, which, due to the very flat nature of the surrounding areas, would probably disperse the flows down Cullen Avenue South, rather than through the site to the drain.

In order that the pavements on the site provide for drainage in low rainfall events not generating overland flows, we have introduced a broad crested weir half way along the on-site overland flow to enable reasonable falls to drainage gullies. This has the effect of slowing the flows after the constriction, and in part, raising the water level, smoothing the flow regime from this point to the existing drain.

5.0 CONCLUSION

We consider that the enclosed drawing provides an optimal solution to handling a previously uncontrolled overland flow through the subject site, and generally meets Council requirements, except as noted. The exceptions are we believe acceptable upon considering the overall future use of the site.

Appendix A

Overland Flow

BCC Drawings
 $C_{10} = 0.88$

$$C_{50} = 1.00$$

$$A = 9.6 \text{ ha}$$

Time of Concentration

$$\text{Length} = 900 \text{ m}$$

$$\text{Height Diff} = 3 \text{ m}$$

For the first 100m use 15 min (Recommended Std. Inlet Time)

The balance 800m Channel Flow from QUDM Table 5.05.7 @ 3m = 14 min.

$$T_c = 15 + 14 = 29 \text{ min.}$$

Round Down to 25 min.

$$Q_{20} = .88 \times 9.6 \times 113 / 360 = 2.65 \text{ cumecs}$$

$$Q_{50} = 1.0 \times 9.6 \times 155 / 360 = 4.133 \text{ cumecs}$$

$$Q_2 = .748 \times 9.6 \times 76 / 360 = 1.516 \text{ cumecs}$$

$$\text{Dia 750 (exist) flowing full @ } 1/440 = .53 \text{ cumecs}$$

$$\text{Overland Flow} = 4.133 - 0.53 = 3.6 \text{ cumecs}$$

Channel at Section AA SK01

$$Q = 3.74 \text{ cumecs}$$
$$V = 2.775 \text{ m/s}$$
$$V \times D_{\text{max}} = 1.04$$
$$V \times D_{1/2 \text{ way across driveway}} = 0.555$$

At weir downstream Section BB SK01

$$\text{Weir length} = 10 \text{ m}$$

$$\text{Weir } C_d = .577$$

$$\text{Weir head} = .355 \text{ m (RL 2.425 water level)}$$

$$\text{Water depth at Critical point} = 0.24 \text{ m (RL 2.31)}$$

$$\text{Critical velocity} = 1.52 \text{ m/s}$$

$$V \times D \text{ at weir} = .365$$

ie. $V \times D$ satisfied at weir

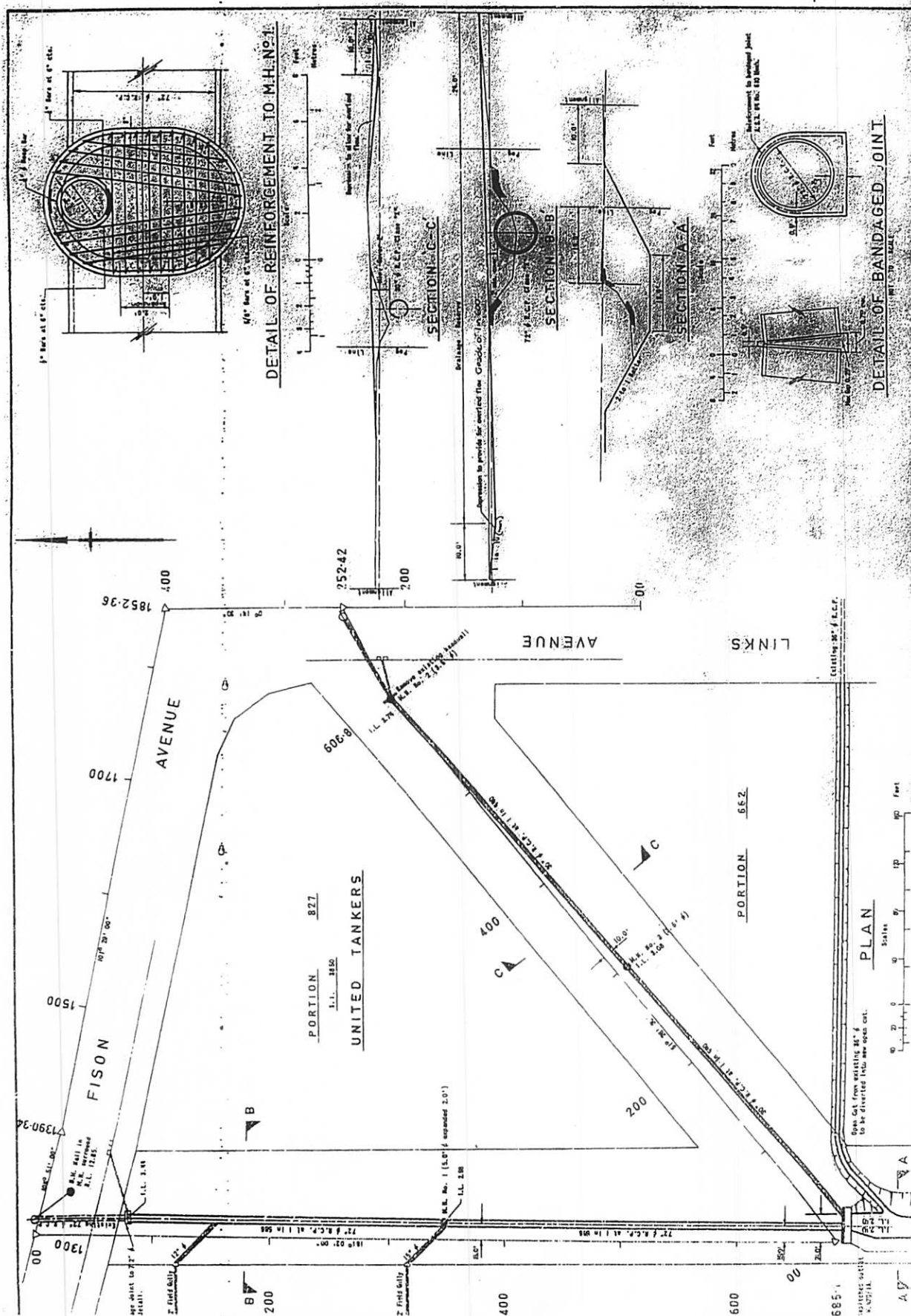
Appendix B

BCC Drawings:

K-16-11.1/42 Piping of Easements Fison & Links Av. Lands

K-16-11.2/6 Hamilton Lands Industrial Area Section 2

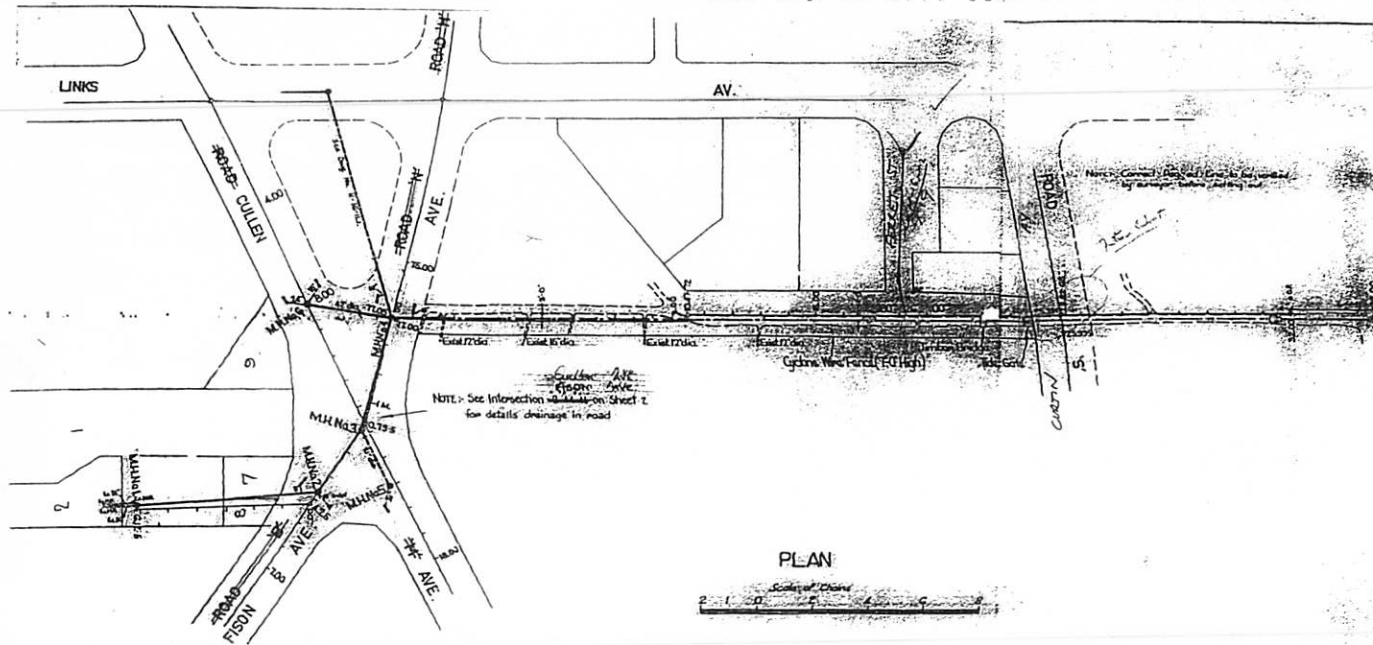
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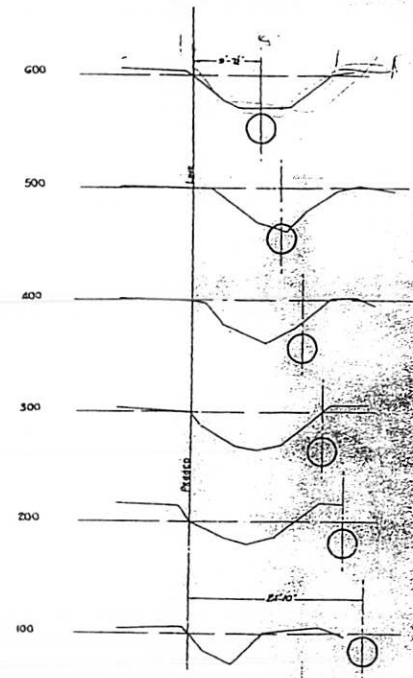
BRISBANE COUNCIL DEPARTMENT OF WORKS									
PIPING OF LEASEMENTS									
FISON, LINKS AVENUE									
HAMILTON LANDS									
Project No.	1000000000	Scale	1:100	Drawn by	W. J. H. H.	Checked by	W. J. H. H.	Approved by	W. J. H. H.
Sheet No.	1	Sheet	1	Sheet	1	Sheet	1	Sheet	1
Project Name	PIPING OF LEASEMENTS								
Location	FISON, LINKS AVENUE								
Client	HAMILTON LANDS								
Project Manager	W. J. H. H.								
Engineer	W. J. H. H.								
Checker	W. J. H. H.								
Approved	W. J. H. H.								
Date	10/10/00								

Wed Sep 15 1999 08:15

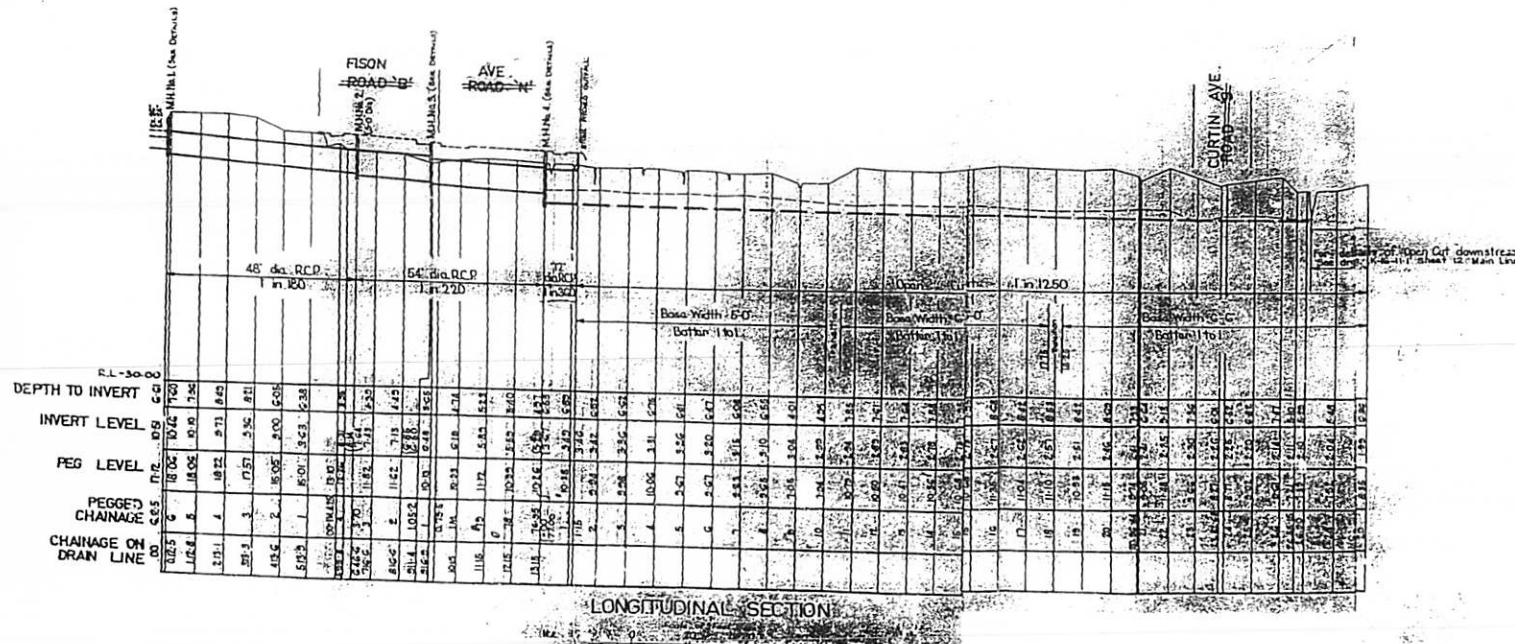
Wed Sep 15 1999 08:15



PLAN



CROSS SECTIONS (Meters)

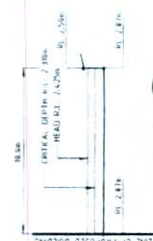


LONGITUDINAL SECTION

BRISBANE CITY COUNCIL
DEPARTMENT OF WORKS

HAMILTON LANDS
INDUSTRIAL AREA
SECTION 2

Date	15/09/99	Drawn	W. J. J. J.	Checked	W. J. J. J.	Approved	W. J. J. J.
Name	W. J. J. J.	Name	W. J. J. J.	Name	W. J. J. J.	Name	W. J. J. J.
Project	W. J. J. J.	Project	W. J. J. J.	Project	W. J. J. J.	Project	W. J. J. J.
Scale	1:100	Scale	1:100	Scale	1:100	Scale	1:100



SECTION



SECTION 

[illegible]

FISON AVENUE WEST

LINKS AVENUE SOUTH

OFFICES

INDUSTRY BUILDING
F.F.E. 2.80

FUTURE BUILDING
OWNED BY NAERU PTY. LTD.

662
SL. 4136

LINE OF PROPOSED
OVERLAND FLOWPATH

CENTRELINE OF OVERLAND
FLOWPATH

LEGEND:

- GULLY
- MANHOLE
- STORMCEPTOR
- STORMWATER PIPE
- ROOFWATER PIPE
- OVERLAND FLOW PATH

Drain

metres



1500

Values quoted apply to
unadopted drainage

A1

Whybird Farr Engineers
STRUCTURAL AND CIVIL CONSULTANTS

25 Main St. Spring Hill Q4000
WHYBIRD BROWN & FARR PTY LTD. A/N 000 649 724
PH: (07) 3831 5655 FAX: (07) 3831 8577



Drawn

Checked

Passed

Scale

P.K.

1500

Title

**PROPOSED STORMWATER
MANAGEMENT PLAN**

Drawing Number

99118-SK1

Rev

|||