STORMWATER MANAGEMENT PLAN
MAMRE ROAD DEVELOPMENT -
MAMRE ROAD, ERSKINE PARK

Revision 4

MAY 2007

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1. INTRODUCTION

1.1 GENERAL

This report has been developed as part of the Construction Certificate of a proposed development within the Erskine Park Employment Area. The report outlines proposed stormwater measures to treat quantity and quality issues specific to the subject development site.

1.2 THE DEVELOPMENT SITE

The subject development site is situated within the Erskine Park Employment Area, in the local government area of Penrith City Council.

The development site comprises an area of approximately 38 hectares located within the "South Western Catchment" as denoted in Penrith City Council's, Erskine Park Employment Area Development Control Plan (Appendix 2 – Map 1 of Council's DCP). Council's DCP also depicts the subject site within the "South Creek" catchment.

The site is bounded by Mamre Road to the east, James Erskine Drive to the north, a water supply easement to the south and a small creek to the west. This creek is a tributary of South Creek and will be further referenced throughout the report as "The Creek".

There are currently two proposed developments located on the subject site, a Kimberly Clark Facility and a Woolworths Facility. These developments will occupy approximately one third of the site, and the remaining land has been earmarked for future development.

The proposed development site is shown on Drawing 07104-SK02 in Appendix A. This drawing also depicts The Creek and site bounding roads.

1.3 OBJECTIVES

The main objective of this Stormwater Management Plan is to provide a best practice approach to the stormwater management to support the Construction Certificate application for the proposed industrial subdivision on this site.

The report addresses the following:

- Water Quantity,
- Rainwater Harvesting,
- Water Quality,
- Salinity.

1.4 PREVIOUS STUDIES AND MODELS

There has been a recent study into the existing flows in the tributaries within the South Creek Catchment (in which the subject site is situated). The study has been completed by Brown Consulting for CSR, in July 2005 enabling the assessment and augmenting of the stormwater infrastructure if necessary to convey the existing flows.

Brown's study has been made available so that floor levels which are affected by the flood levels in The Creek may be set. The study also details the permissible site discharge of the subject site which the downstream infrastructure has been designed to convey.

Under instruction from Penrith City Council the predevelopment catchment which has been used in the study has been altered from the actual pre development catchment. This has been done by Council from a planning point of view which will allow developments such as the one proposed to have a viable site discharge point, and will ensure the safe conveyance of stormwater through the Council infrastructure.

The pre development and post development catchments will be further discussed in Section 2.2.1 of this report.

2. STORMWATER QUANTITY

2.1 CATCHMENT ANALYSIS

The Creek catchment to which the subject development site contributes to is extensive. As stated in Section 1.4 above, Brown Consulting Engineers have analysed the entire Creek catchment for CSR for the purposes of the design of the stormwater infrastructure required to convey the water through the Erskine Park Employment Area.

The assessment of this catchment by Brown has enabled finished floor levels to be set on the development site as well as quantifying the permissible discharge into The Creek for the development.

2.2 SITE ANALYSIS

2.2.1 Catchment Description

The subject development site is currently undeveloped farming land. The site is largely pervious with small dotted areas of imperviousness such as small farm sheds.

As previously stated in Section 1.4, the post developed catchment areas differ to those that have been used in the Brown study. In the actual pre developed state, a large proportion of the subject site drains directly to the east towards Mamre Road. This discharge is then conveyed through an existing culvert under Mamre Road to downstream receiving waters. However, Penrith City Council has allocated the whole of the subject site to drain to The Creek in Brown's study of the pre developed state. This has meant that Brown's study will dictate the allowable discharge from the subject site to The Creek, and not the actual pre development condition.

There are two distinct discharge points when assessing the subject site as a whole;

- The Creek
- Mamre Road (through existing culverts)

The catchments of the subject site have been defined based on the existing predevelopment catchment, and the site catchment detailed in Brown's study as developed by Penrith City Council.

In order to maintain environmental flows to the developed catchment, it has been proposed that the proposed Kimberly Clark facility will continue to discharge to Mamre Road, and the remainder of the site will discharge to The Creek. The proposed Woolworths facility and the proposed access road will be drained to The Creek via a proposed easement.

The subject site catchment plan is shown on Drawing 05238-SK01 in Appendix A, which details the actual pre development catchment boundaries (prior to Brown's study), the proposed catchment boundaries, their proposed discharge points and the proposed drainage easement.

2.2.2 Hydrological Analysis

The intention of this section of the report is to address the effects of flooding due to the proposed development, in particular, to assess the requirement for On-Site Detention. This section of the report will also review flood levels in The Creek as determined by Brown in their study and review impacts of these flood levels on proposed future developments within the site as well as propose finished floor levels based on the flood levels obtained.

The main criteria for the stormwater quantity control is to ensure that the post developed peak flows do not exceed the capacity of the downstream infrastructure i.e. the pre development peak flows as determined in the Brown report.

As there are two distinct discharge points from the site, they will be assessed separately in this section of the report for clarity.

2.2.2.1 Catchments Draining to The Creek

The proposal is to drain the entire site except for the proposed Kimberly Clark facility to The Creek. The proposed lots within this area will have to control the discharge into The Creek such that it does not exceed the pre developed flow as determined by Brown in their study.

It is proposed that the retention and controlled discharge of stormwater will be achieved by each lot having their own On-Site Detention (OSD) systems with the resulting total combined discharge leaving the site not exceeding the allowable flow as determined by Brown Consulting.

Utilising the study by Brown, a permissible site discharge (PSD) per hectare was able to be developed for the 2, 20 and 100 year ARI for all catchments draining towards The Creek. These figures are detailed below in Table 2.1.

Permissible Site Discharge Per Hectare		
ARI	**Allowable Flow (m^3/s)**	**PSD ($m^3/s/Ha$)**
2	1.28	0.045
20	2.28	0.082
100	3.6	0.12

Table 2.1 - Permissible Site Discharge Per Hectare

The established PSD has been used to assess a probable per Hectare OSD sizing using the DRAINS software package. The resulting OSD size has been estimated at $300m^3/Ha$. This estimation is for the purposes of planning. The discharge constraints placed on the site by the Brown study by way of permissible site discharge will allow detail OSD design to be completed and as such should be completed for all proposed lots which drain towards The Creek.

In addition to the allowable discharge, the Brown study has identified the 100 year flood level in The Creek which will impact on the proposed future development lots. The area of the site affected by the flood level in The Creek is located in the North East corner. Any future development in this area will need to

achieve a minimum 500mm freeboard from the flood level to the finished floor level.

Brown's study has identified that the flood level will rise to a level of 39.2m AHD at the north east corner of the site. In accordance with Penrith City Council's requirements 500mm of freeboard will be maintained between the flood level and the proposed finished floor level (FFL), hence the FFL proposed is 39.7m ADH (as a minimum level).

The proposed development lots to the west of the proposed drainage easement have been shown to have a FFL of 39.5m AHD. This level has not been set due to flooding issues; rather it is a suggested level to allow adequate drainage from the lots to The Creek and allowing potential underground OSD tanks. These floor levels may vary as details of drainage constraints become available.

2.2.2.2 Catchment Draining to Mamre Road

A mentioned above the proposed Kimberly Clark facility has been designated to drain to the existing culverts under Mamre Road. This has been done to maintain a flow regime through that area similar to that of the actual natural pre developed state. This has been proposed to maintain environmental flows downstream of Mamre Road to ensure the health of the natural watercourse is not affected by the development.

For these environmental flows to be achieved the actual natural pre development must be used to determine the flows which should be discharged to maintain the health of the water course.

3. Rainwater Harvesting

A rainwater harvesting scheme has been devised for the Erskine Park Estate, which encompasses all lots within the site. This rainwater harvesting scheme captures rainwater from the roofs of each proposed lot and transports the water to a regional collection point.

The rainwater harvesting storage requirements for the Estate have been established and the following shall be installed;

> *Roof water reservoirs or storage tanks with a capacity of at least 440KL/Ha of roof services or 190KL/Ha gross land area (which ever is larger), and the ability to discharge flows (by way of pumped rising mains or gravity mains) to any regional rainwater harvesting infrastructure at a rate of 11.5l/s per megalitre of storage.*

To comply with the above, each individual lot is to provide on-site storage for the collection of rainwater and attenuate to the outlet flows to 11.5l/s per megalitre of storage.

The rainwater storage infrastructure will be designed so that there is minimal risk of contamination of the rainwater. This will involve the use of bolt down impervious lids for pits associated with the rainwater harvesting lines both on the individual lots as well as the Estate reticulation lines. In addition to this, the design of any rainwater storage tanks shall include breather pits/vents and surcharge points which have also been designed to minimise the risk of contamination.

To facilitate the collection of the Rainwater from each lot's storage reservoir/tank, infrastructure has been proposed throughout the Erskine Park Estate. This infrastructure consists of small diameter (225mm to 300mm) pressure pipe, and will convey the rainwater by gravity to an Estate pumping station for final transportation to the regional connection point. The pumping station itself will have a small buffer tank to maintain the required water levels for the safe operation of the pumps as recommended by the pump manufacturer.

The rainwater harvesting scheme will impact on the on-site detention and environmental flow requirements due to the rainwater harvesting scheme effectively reducing the catchment draining to the local area. However, the rainwater harvesting scheme is expected to come online in two years time, and as such there will be a time delay between the completion of the rainwater harvesting infrastructure including some site storage facilities and the implementation of the rainwater harvesting scheme. This has resulted in an interim condition.

In the interim, before the rainwater harvesting scheme is implemented, the individual lots shall provide on-site detention for the entire site area as outlined in Section 2 of this report.

When the rainwater harvesting scheme is implemented, each lot will provide rainwater storage tanks (with attenuated outflow) for the roof areas and on-site detention for all other areas. At this time environmental flows will need to be maintained with the reduced catchments and as such the on-site detention flow attenuation device (orifice plate or otherwise) will need be modified from the interim condition state.

It may be prudent for the utilisation of the rainwater storage facilities as OSD for the roof catchments in the interim condition. This will allow the construction of a separate OSD to cater for all areas other than roof areas which will be sized correctly for the final condition, once the rainwater harvesting scheme has been implemented.

4. STORMWATER QUALITY

4.1 Introduction

The quality of runoff from a catchment depends upon many factors such as land use, degree of urbanisation, population density, sanitation and waste disposal practices, landform, soil types, and climate. Pollutants typically transported by runoff include litter, sediment, nutrients, oil, grease, and heavy metals. Whilst these pollutants have deterious impact on receiving water quality, the suspended solids and nutrients cause the most detrimental impact on the environment. Litter, oils, and other surfactants have an aesthetic impact.

Activity within a catchment during urbanisation includes the disturbance of vegetation, removal of topsoil, landshaping, road construction, installation of services, and building works. It is during this phase that the sediment movement is greatest and is estimated that the sediment production levels may be up to 6 times higher than under the existing conditions. However, once development is completed, the sediment loading may return to the existing level or remain at a higher level depending on land management practices.

This section of the report addresses the long term impacts of the development on water quality. For short term effects (i.e. during the construction phase) water quality control is achieved by implementing the measures documented in the Soil and Water Management Plan to be included in this submission.

4.2 Water Quality Criteria

The stormwater management strategy should be based on current best practice to achieve pollutant retention criteria set in Penrith City Councils “Erskine Park Employment Area Development Control Plan” (December 2002).

The retention criteria are as follows:

- Litter – 70% of material greater than or equal to 5mm diameter.
- Coarse Sediment – 80% of the load for particles less than or equal to 0.5mm diameter.
- Nutrients – 45% retention of the load for Total Phosphorus and Total Nitrogen.
- Fine Particulates – 50% of the load for particles less than 0.1mm diameter.
- Free Oil and Grease – 90% of the load with no visible discharge.

4.3 Water Quality Control Measures

It is proposed that “at-source” pollution control be implemented for the subject development. These pollution controls will be placed on each individual lot, and be tailored to each lot’s individual pollutant load.

There are number of “at-source” pollutant rentension measures that can be implemented to reduce pollutant loadings. Such measures may include:

- Litter baskets
- Gross Pollutant Traps (GPT)
- Sediment pits
- Grassed swales
- Vegetation Buffers
- Bioretention basins/swales

Whilst all of the above are effective in reducing pollutant loadings to some degree, by far the most effective control system is a combination of two or more of the above measures in a conveyancing system, known as Treatment Train. This is because each one of the above measures has a varying effectiveness for different types of pollutants.

An example of a possible Treatment Train consists of a GPT, vegetation buffer, and bioretention basin/swales. The GPT will intercept the majority of gross pollutants greater than 3mm then the vegetation buffer would filter coarse sediments before the final treatment by bioretention.

Each measure listed above is described below:

Gross Pollutant Trap

As the name implies, this device is provided to trap gross pollutants including litter and sediments. The design of GPTs is site specific depending on intended use.

GPTs are generally sized to treat 50% of the 1 in 1 year storm with a pollutant holding capacity equal to a third of annual load.

Depending on the proposed final use for each lot, some GPT's may also require the ability to capture hydrocarbons. Such GPT's are available such as the HUMEceptor by Humes, or the ROCLA Downstream Defender.

Vegetation Buffer

A vegetation buffer is a filter system that filters small surfactants by vegetation. It is a form of shallow swale system with thick vegetation cover.

Bioretention:

A bioretention system is a vertical filtration system that filters stormwater through a prescribed media (eg. sandy loam) before being collected by an underlying perforated pipe for subsequent discharge to the receiving water.

The filtration media should have a permeability of at least one order of magnitude higher that the surrounding soils to ensure that the pathways of stormwater through the system is well-defined and directed at the perforated pipe underlain.

4.4 Current Development Sites

At the time of this report there are currently two development consents which cover the Kimberly Clark Facility, Woolworths and the Estate Access Road.

The water quality control devices for these developments have been established and detailed on design drawings. A summary of the water quality control measures for these developments are as follows;

4.4.1 Woolworths

The stormwater from the Woolworths facility is to be treated for gross pollutants and hydrocarbons before discharge to Council's stormwater system. The gross pollutants will be collected on the trash rack within the on-site detention (OSD) system. Downstream of the OSD a ROCLA "Downstream Defender" is to be installed which will collect hydrocarbons and small particles which pass though the trash rack within the OSD.

4.4.2 Estate Access Road

The Estate Access Road stormwater will pass through a ROCLA "CleansAll" before discharge to Council's stormwater infrastructure. The ROCLA "CleansAll" is to be installed to collect gross pollutants and the small quantities of greases and oils which may be present on the road.

4.4.3 Kimberly Clark Facility

The treatment of the stormwater on the Kimberly Clark Facility is similar to Woolworths with the use of a ROCLA "Downstream Defender" to collect hydrocarbons and fine particles. As there are no on-site detention requirements for the Kimberly Clark Facility, there is no trash rack present to collect gross pollutants. As such before treatment by the Downstream Defender the stormwater will pass though a ROCLA "CleansAll" which will collect the gross pollutants present in the stormwater.

4.5 Water Quality Modelling

Water quality modelling relies on numerous factors and assumptions. There is a lack of calibrated data available within Australia, which places limits on the accuracy of water quality modelling.

With reference to Table 1 in Part 2 of Penrith City Councils Erskine Park Employment Area Development Control Plan it is proposed that "Actual Event Load" modelling is used to conceptually determine the adequacy of proposed water quality treatment devises.

A suitable water quality model for this project is the MUSIC (Model for Urban Stormwater Improvement Conceptualisation) water quality numerical model developed by the MUSIC Development Team of the CRC for Catchment Hydrology. MUSIC is an event basis, and will simulate the performance of a group of stormwater management measures, configured in series or in parallel to form a "treatment train".

It is expected that a water quality model such as MUSIC will be used as a planning tool to ensure that the pollutant retention criteria presented is

achieved by each of the individual lots as they are developed over time. This will ensure that the site specific pollutants will be addressed as this information becomes available.

5. INSTALLATION, MONITORING AND MAINTENANCE

Installation, monitoring and maintenance requirements for stormwater infrastructure including all pollution control facilities will be specified in the construction documentation which will include manufacturers recommended installation methods and procedures as well as works specifications. All stormwater infrastructure will be maintained for the specified periods after "Practical Completion".

During the maintenance period, monitoring of stormwater quality control structures will be undertaken in order to demonstrate their satisfactory performance. The monitoring shall be conducted in accordance with Council's and the manufacturer's recommendations.

During the maintenance period the land owner will conduct six monthly inspections of all stormwater infrastructure and provide a report to Council. The report(s) will address the condition of the infrastructure, the rainfall record of the previous six months, the maintenance undertaken and/or additional maintenance required. The report(s) will also address the effectiveness of the infrastructure in meeting its performance objectives as supported by an associated water quality testing program to be determined by agreement with Council.

The proposed Estate road at Lot 141 Mamre Road, Erskine Park (off James Erskine Drive) will be dedicated to Penrith City Council following Practical Completion. Future maintenance for the stormwater system will be carried out by Council.

Macquarie Goodman as Landlord will be responsible for the maintenance of the stormwater system as well as the rainwater harvesting system following completion of the building works on the developed lots under approvals 06_0253 & 06_0254 as well as subsequent lots that will be developed. A detailed Stormwater Monitoring Program will be prepared as part of the Operational Environmental Management Plan to be submitted at a later stage. This plan will incorporate frequency of monitoring, criteria for observation and measurement as well as actions for non-compliance.

6. Salinity

The salinity of the soil within a development area may impact on any proposed development. Saline soil can potentially damage in ground reinforced concrete pipes, or introduce salt into the stormwater systems through groundwater to stormwater transfer.

There is the potential for the development site to be affected by saline soils, and as such preliminary salinity investigation work is currently being undertaken by Douglas Partners Geotechnical Engineers. If it in fact is found that there is a salinity issue in the area the following remedial actions may be employed to ensure the health of the local and downstream stormwater system are maintained.

6.1.1 Stormwater Pipes and Structures

For stormwater pipes, ROCLA has been consulted for the suitability of standard covered pipes (10/10 cover) used on site. In general, the standard covered pipes will be suitable for up to moderate saline soils but requires marine grade pipe (20/20 cover) for high and very high saline soil areas.

The cover to reinforcement requirements should be specified to comply with the relevant Australian Standards namely AS4058 and AS3600.

6.1.2 Groundwater

It should be proposed that the base of any proposed bio-retention/detention basins which are deemed to be impacted on by any possible salinity issue will to be lined with either High Density Polyethylene (HDPE) or a layer of compacted clay with a low hydraulic conductivity. This lining will extend up the sides to finished ground levels. This will create an impermeable layer between any rising saline groundwater and the bio-retention/detention basins thus preventing its entry into the basins preventing ponding of saline groundwater in the basins.

The impermeable layer is also designed to eliminate groundwater recharge from any basin due to the soils in the bio-retention basins having a greater hydraulic conductivity than the surrounding clays. This eliminates recharge back in to the groundwater system which will help prevent the water table from rising.

It should be noted that in order to reduce ground water recharge, native species should be used for landscaping where possible. The native species will require less watering than exotic species thus reducing the amount of water being added to the existing groundwater system.

7. CONCLUSION

Urbanisation of the site will inevitably lead to significant changes in water quantity as well as quality. The traditional stormwater management and investigation that only considers impacts of flooding and flood mitigation is a thing of the past. Stormwater management practices must now also consider water quality, aquatic habitats, aesthetic and economic issues.

The development of the subject site may cause adverse environmental and social impacts if not properly managed at the construction stage as well as post-development stage.

The proposals shown in this report indicate that the development with suitable stormwater management could provide a safe and ecologically sustainable environment.

REFERENCES

- INSTITUTION OF ENGINEERS, AUSTRALIA - "Australian Rainfall and Runoff", 1987, 3rd edition.

- INSTITUTION OF ENGINEERS, AUSTRALIA - "Australian Runoff Quality – A Guide to Water Sensitive Urban Design", 2006.

- CRC for Catchment Hydrology - MUSIC Software Version 2.0, 2003

- PENRITH CITY COUNCIL – “Erskine Park Employment Area Development Control Plan”, December 2002

- BROWN CONSULTING – Streamworks Management Plan CSR Western Creek, Erskine Park – Revision 01, July 2005.

APPENDIX A – DRAWINGS

NOTE:
EACH INDIVIDUAL LOT TO PROVIDE 440m^3 PER HECTARE OF ROOF OR 190m^3 PER HECTARE OF GROSS LOT AREA (WHICH EVER IS LARGER) OF ROOF WATER STORAGE AND CONNECT TO THE ESTATE WATER HARVESTING RETICULATION SYSTEM SHOWN.
EACH STORAGE TANK IS TO HAVE A MAXIMUM OUTFLOW OF 11.6L/s PER MEGALITRE OF STORAGE.

JAMES
MAMRE
ROAD
ERSKINE
DRIVE

ROCLA CLEANSALL
600mm GPT

LOT CONNECTION STUB. TYPICAL

Ø3000 DOWNSTREAM
DEFENDER

OSD TANK

RAINWATER HARVESTING
STORAGE TANK

RAINWATER HARVESTING PUMPING STATION NTS
(INDICATIVE ONLY)

WATER QUALITY GPT (DOWNSTREAM
DEFENDER Ø2400 CLEANSALL 600)

RAINWATER HARVESTING
STORAGE TANKS (NO OSD
TANKS REQUIRED)

CONNECT TO REGIONAL RAINWATER
HARVESTING INFRASTRUCTURE

KIMBERLY CLARK

WOOLWORTHS DISTRIBUTION CENTRE

LEGEND

- PROPOSED BOUNDARY
- ESTATE WATER HARVESTING INFRASTRUCTURE
- PROPOSED WOOLWORTHS STORMWATER INFRASTRUCTURE
- PROPOSED KIMBERLY CLARK RAINWATER INFRASTRUCTURE
- PROPOSED KIMBERLY CLARK HARDSTAND INFRASTRUCTURE
- ROAD STORMWATER PIPES
- RM RM RISING MAIN
- OSD TANK
- RAINWATER HARVESTING STORAGE TANK

NOTES FOR KIMBERLY CLARK COMPLEX:

- PRIOR TO THE IMPLEMENTATION OF THE ESTATE WATER HARVESTING SCHEME, ROOF WATER RUNOFF WILL BE ROUTED THROUGH THE RAINWATER HARVESTING TANKS AND DISCHARGED TO THE STORMWATER OUTLET AT MAMRE ROAD. AS NO OSD IS REQUIRED, THE HARDSTAND RUNOFF IS ROUTED DIRECTLY TO THIS STORMWATER OUTLET AT MAMRE ROAD.
- ONCE THE ESTATE WATER HARVESTING SCHEME IS OPERATIONAL, THE ROOF WATER DISCHARGING FROM THE RAINWATER HARVESTING TANKS WILL BE REROUTED TO THE ESTATE WATER HARVESTING INFRASTRUCTURE. THE CONNECTION FROM THE RAINWATER HARVESTING TANK TO THE STORMWATER OUTLET AT MAMRE ROAD WILL BE DISCONNECTED AND CAPPED. HOWEVER THE HARDSTAND RUNOFF WILL CONTINUE TO DISCHARGE TO THE STORMWATER OUTLET.

NOTES FOR WOOLWORTHS COMPLEX:

- PRIOR TO THE IMPLEMENTATION OF THE ESTATE WATER HARVESTING SCHEME, BOTH THE RAINWATER HARVESTING STORAGE TANK AND THE OSD TANK WILL BE USED TO DETAIN BOTH ROOF AND HARDSTAND RUNOFF TO THE PERMISSIBLE SITE DISCHARGE.
- ONCE THE ESTATE WATER HARVESTING SCHEME IS OPERATIONAL, THE OSD TANK WILL CONTINUE TO DETAIN HARDSTAND RUNOFF, WHILST THE RAINWATER HARVESTING TANK WILL COLLECT ROOF RUNOFF FOR DISCHARGE TO ESTATE WATER HARVESTING INFRASTRUCTURE.

REVISION	AMENDMENT	DATE	REVISION	AMENDMENT	DATE
01	ISSUE FOR APPROVAL	07.05.07			

Client: MACQUARIE GOODMAN
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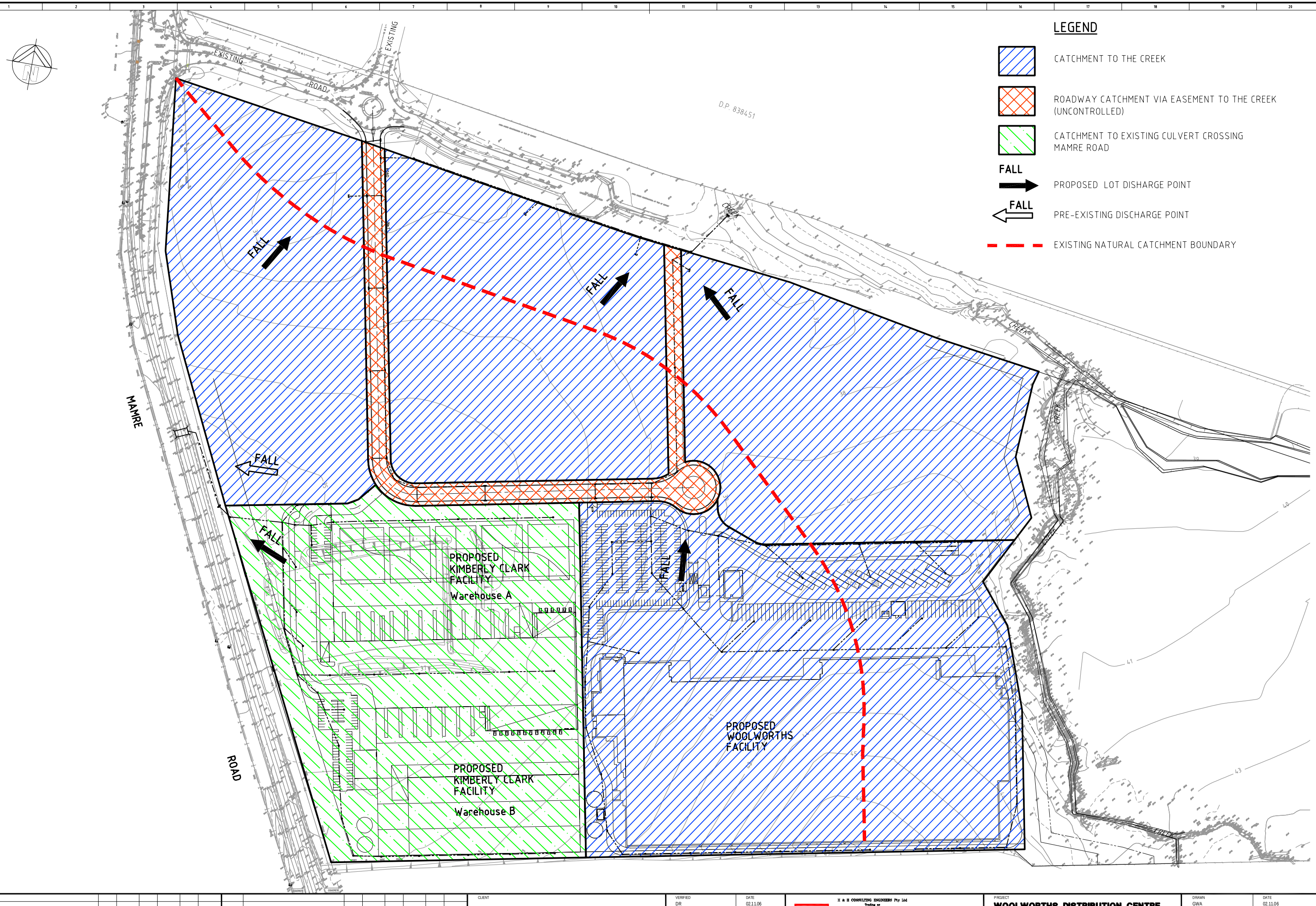
Project: ERSKINE PARK DEVELOPMENT

Title: STORMWATER AND QUALITY CONTROL LAYOUT PLAN

Drawn	Designed	Date
OW	DR	07.05.07
Checked	Approved	Scale
DR	GH	1:1500

Drawing number: 07104_SK02
Revision: 01



REVISION	AMENDMENT	DESIGNED	DATE	VERIFIED	DATE	APPROVED	DATE

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MACQUARIE GOODMAN

SURVEYOR
MACQUARIE GOODMAN

VERIFIED	DATE
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APPROVED	DATE
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PROJECT
WOOLWORTHS DISTRIBUTION CENTRE ERSKINE PARK EMPLOYMENT AREA

TITLE
CATCHMENT PLAN

DRAWN	DATE
GWA	02.11.06
DESIGNED	SCALE
DR	1:1250 @ B1

DRAWING No.
05238_SK01

REV
01