Lewisham Estate

78-90 Old Canterbury Road
Lewisham

Stormwater Management Report

Prepared For:

Lewisham Estates Pty Ltd

Prepared By:
Cardno ITC
Level 7, 33 YORK STREET
SYDNEY NSW 2000
Tel: 612 9495 8100
Fax: 612 9495 8111

October 2010

DOCUMENT HISTORY

Issue No.	Revision No.	Date	No. of Pages	Comment
A	0	11.10.10	12	Preliminary Issue – Draft Only
A	1	14.10.10	11	Final Issue
A	2	26.10.10	11	Final Issue – Revised Master Plan

DOCUMENT APPROVAL:

Approved by: _____ Date: 26/10/2010

(Cardno ITC)

CONTENTS

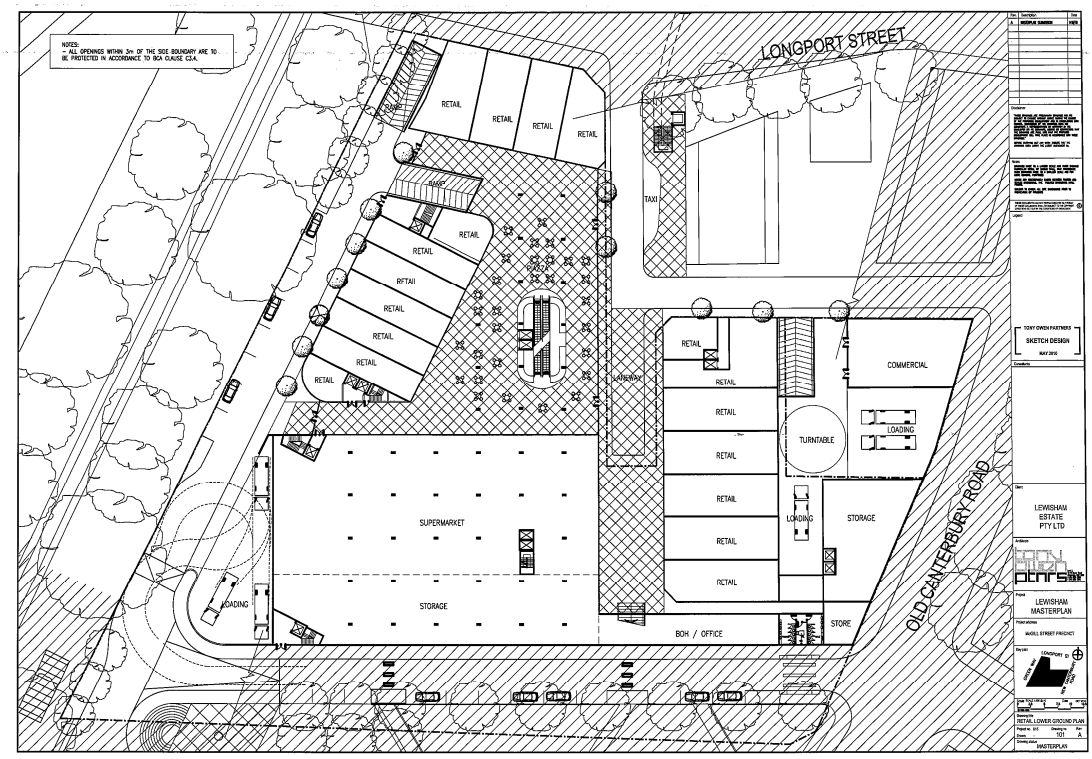
1 EXECUTIVE SUMMARY

This document is a stormwater management report for the proposed development located at 78-90 Old Canterbury Road, Lewisham. The site is legally described as Lot 11 in DP 774322 and Lots 6-8 in DP 977044.

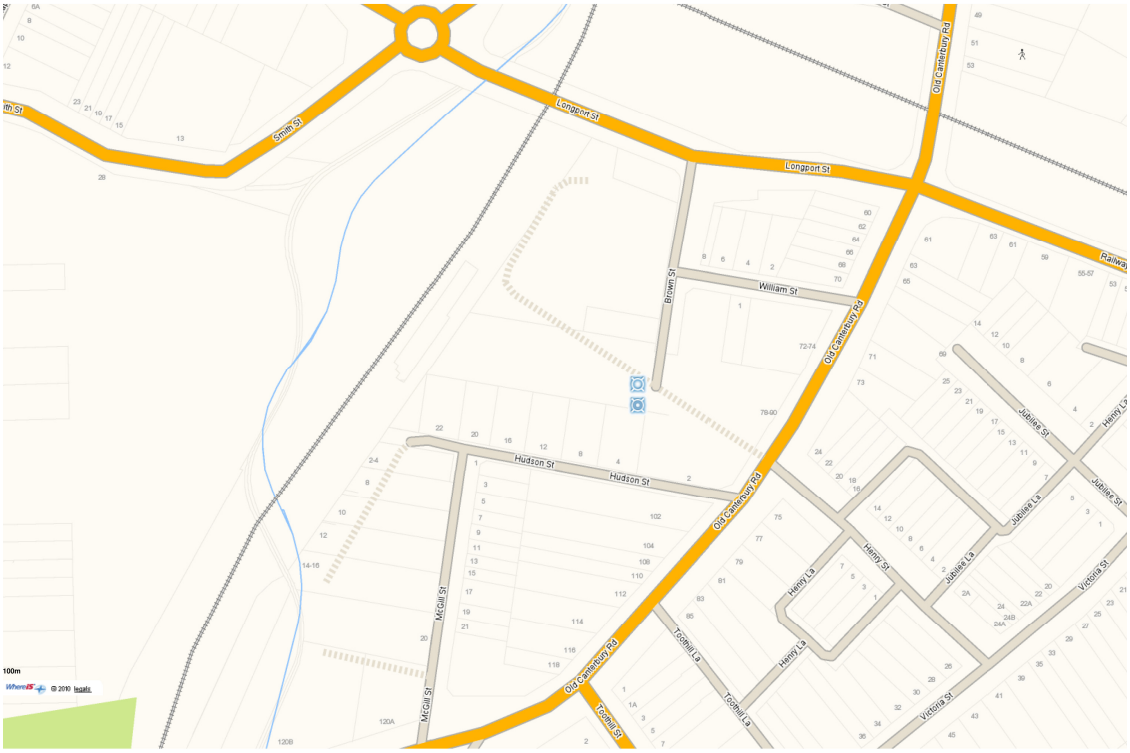
Lewisham Estates P/L in conjunction with Planning Ingenuity P/L are currently preparing a Concept Plan for a Major Project comprising a mixed use development for residential, commercial and retail land uses with associated car parking facilities and public domain improvements.

The Concept Plan is for buildings ranging in height from 4 to 9 storeys. Public domain improvements include the creation of new streets, open space areas and pedestrian access points.

The proposed facility is illustrated below:-



2 SITE LOCATION



3 STORMWATER MANAGEMENT & DESIGN STRATEGY

3.1 Reference Documents

The following documents have been reviewed and used to prepare the stormwater strategy and this section of the report:-

1. Architectural drawings ref. Prepared by Tony Owen & Partners;
2. Survey drawing ref. 1593-DT01 prepared by StrataSurv revision G dated 04.06.2009;
3. Australian Rainfall & Runoff (AR&R) dated 1997 by the Institution of Engineers, Australia;
4. Marrickville Council Stormwater and On-Site Detention Code (19 February 1999); and
5. Stormwater Asset plans received from Council.

3.2 Glossary

Annual Exceedance Probability (AEP)

The chance of a flood of a given or a larger size occurring in any one year, usually expressed as a percentage.

Australian Height Datum (AHD)

A common national surface level datum approximately corresponding to mean sea level.

Average Recurrence Interval (ARI)

The long term average number of years between the occurrence of a flood as big as or larger than the selected event.

Catchment

The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Flood

Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse.

Flood Liable Land

Land susceptible to flooding by the PMF.

Flood Planning Levels (FPLs)

Are the combinations of flood levels and freeboards selected for floodplain risk management purposes.

Freeboard

Is a factor of safety typically used in relation to the setting of floor levels.

Habitable Room

In industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to damage in the event of a flood.

Peak Discharge

The maximum discharge occurring during a flood event.

Probable Maximum Flood

PMF is the largest flood that could conceivably occur at a placation, usually estimated from probable maximum precipitation.

Probable Maximum Precipitation

PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year.

Runoff

The amount of rainfall which actually ends up as stream flow.

3.3 Site Description

The site is a large block of land legally described as Lot 11 in DP 774322 and Lots 6-8 in DP 977044 in the suburb of Lewisham. The site falls in the Local Government Area of Marrickville Council.

The site is located on the northern side of Hudson Street and is bounded by Old Canterbury Road to the East, Longport Street to the North and the railway lines to the West. William and Brown Streets bound the north eastern part of the site.

The site has an irregular shape and is characterised by a gentle natural gradient from East to West.

The site is currently fully developed with old warehouses and bitumen areas. The site is bisected by a 900mm/1200mm stormwater pipe traversing from East to West and draining the low lying area of Brown Street.

3.4 Development Description

The proposed development comprises of a mixed use development for residential, commercial and retail land uses with associated car parking facilities and public domain improvements.

3.5 Field Work and Observations

Site visit has been undertaken on the 20th of November 2009 to familiarise with the site and the surrounding areas and to determine site opportunities and constraints.

The visit allowed for visual investigation of the site area and the existing drainage network to be done.

3.6 Authorities Requirements

3.6.1 Marrickville Council

The Council requirements are detailed in Council's Stormwater and On-Site Detention Code and are summarised below:-

- The proposed development is to comply with the Stormwater Code;
- The internal stormwater network is to be designed to cater for 20-year ARI storm event. Full hydraulic calculations are required for the construction certificate stage; and
- On-Site Detention is required and is to be designed using a Time-Area model for storms from 5-year to 100-year ARI. Because the site area exceeds 1000m^2, the site discharge is to be limited to the equivalent fully pervious discharge for the site area.

Site specific advice was received from Council as follows:-

- The site is not considered flood affected;

- The site is traversed with a 900mm pipe draining part of Old Canterbury Road. The pipe becomes 1200mm beyond Brown Street and continues under the railway line to the East; and
- Full hydraulic calculations are required to size the OSD system.

3.6.2 Sydney Water Corporation

Sydney Water owns the main drain into which the 1200mm pipe connects further downstream of the railway corridor under Longport Street.

The development may be referred to Sydney Water Corporation for their comments and Sydney Water may impose additional requirements.

3.6.3 RailCorp

The development may also be referred to RailCorp for comments because the site discharges into the pipe line under the rail corridor.

3.7 Stormwater Management

3.7.1 General

The stormwater management covers the following aspects of the design:-

- Internal site drainage design including the provision of OSD as required by the relevant authority;
- Water quality control; and
- Diversion of trunk main traversing the site.

3.7.2 Site Drainage

The roof drainage system will be designed to cater for 20-year ARI storm event in general and 100-year ARI in the event where no failsafe overflow can be provided.

The surface drainage system servicing the site is designed to cater for 20-year ARI storm event with overland flow paths provided around the proposed buildings for storms in excess of the design storm. Five (5) minutes rainfall intensities have been adopted for the calculation of the flows through the system. Refer to the IFD table included in Appendix 1 for rainfall intensity values.

The drainage system is a combination of minor and major systems capable of conveying the flows to the lawful discharge point. Council advised that On-Site Detention (OSD) will be required for the proposed development.

It is proposed to connect to Council's stormwater infrastructure on the western boundary of the site to retain the existing site discharge point. Specifically, the connection will be made to the 1200mm diameter trunk main.

The proposed impervious areas cover approximately 90% of the total site area. An impervious fraction of 0.9 has been adopted. The following runoff coefficients are used:-

- C_{20} = 0.91; and
- C_{100} = 1.00.

OSD is designed using a Time-Area runoff routing model as requested by Council. This is to ensure that the discharge from the site matches the pre-development discharge for all storms up to and including the 100-year ARI storm event. This strategy ensures that the proposed development will not have an adverse impact on Council's infrastructure and the downstream catchment.

For this purpose, a "DRAINS" model was set up for the site to design and size a suitable OSD system. The model uses the site in its natural undeveloped state (100% pervious) as the pre-development condition to determine the maximum permissible site discharge.

A summary of the "DRAINS" model results is tabulated below:-

ARI (years)	Pre-Developed Flows (m^3/s)	Post-Developed Flows (m^3/s)	OSD Volume (m^3)	Total Site Discharge (m^3/s)
5	0.197	0.535	208.5	0.196
20	0.312	0.701	331.9	0.226
100	0.455	0.820	418.3	0.451

The results indicate that the site discharge is below the pre-developed natural state of the site for minor, intermediate and major storm events. The detailed results of the simulations are included in Appendix 3.

It is proposed to install an OSD tank under the proposed internal road along the western boundary.

The tank will have a minimum volume of 418.3m^3. The discharge from the tank will be configured to have a low level outlet to control the minor storms in the form of an orifice and a high level outlet in the shape of a spillway weir inside the tank for large storm event.

3.7.3 Water Quality Control

During construction, a soil and water management plan will be implemented to control the transportation of silt and sediments from the disturbed areas. The erosion control measures will be in accordance with the current industry practice and as a minimum in accordance with the publication "Managing Urban Stormwater: Soils and Construction" known as the Blue Book.

In the permanent long term status, the site's runoff will be treated prior to discharging into the receiving trunk main. A treatment train approach will be used as follows:-

- Roof runoff will be collected for reuse within the site. This will allow reduction of water quantity discharge from the site;
- Installation of rain gardens where suitable; and
- Installation of a gross pollutant trap at the discharge point.

3.7.4 Trunk Main Diversion

The trunk main traversing the site will have to be diverted around the proposed building areas. A concept diversion plan is included in the drawings under Appendix 2.

The trunk main diversion from Old Canterbury Road will be designed to cater for 100-year ARI storm event because the overland flow path through the site low point of the site is blocked by the proposed development.

The existing trunk main through the site will be completely demolished and removed up to Brown Street. The low point in Brown Street will be drained through a new pipe system through the site. The diversion pipe will be designed to cater for 20-year ARI storm event as overland flow path can be provided through the open areas of the proposed development.

The existing trunk main between Brown Street and the western site boundary will also be completely demolished and removed once the Brown Street diversion pipe is constructed and fully operational to the relevant authority's requirements.

The plan in Appendix 2 shows a concept design for the proposed stormwater trunk main diversions.

APPENDIX 1

Rainfall Data

IFD Table for Marrickville Council

Intensity Frequency Duration (IFD) Rainfall Data

Marrickville

2 year	*50 year*
I_1 *hr : 40.0*	I_1 *hr : 85.0*
I_{12} *hr : 8.0*	I_{12} *hr : 16.0*
I_{72} *hr : 2.5*	I_{72} *hr : 5.0*

AVERAGE RECURRENCE INTERVAL (ARI) years

TIME	2	5	10	20	50	100
5 mins	126.5	160.8	180.4	206.6	240.6	266.3
6 mins	118.7	151.3	170	194.8	227.1	251.6
7 mins	112.1	143.3	161.2	184.9	215.8	239.3
8 mins	106.6	136.4	153.6	176.4	206.1	228.7
9 mins	101.7	130.5	147.1	169	197.6	219.4
10 mins	97.5	125.2	141.3	162.5	190.1	211.2
12 mins	90.3	116.3	131.4	151.3	177.4	197.2
14 mins	84.3	109	123.3	142.1	166.8	185.6
15 mins	81.8	105.8	119.7	138.1	162.2	180.5
16 mins	79.4	102.8	116.5	134.4	157.9	175.8
18 mins	75.1	97.5	110.6	127.7	150.3	167.4
20 mins	71.4	92.9	105.5	121.9	143.6	160.1
25 mins	64	83.6	95.1	110.2	130	145.1
30 mins	58.3	76.4	87.1	101.1	119.5	133.5
40 mins	50.1	66	75.5	87.8	104.1	116.6
50 mins	44.3	58.7	67.3	78.4	93.2	104.6
1 hours	40	53.2	61.1	71.4	85	95.5
1.5 hrs	31	41	47.1	54.9	65.2	73.1
2 hours	25.7	34	38.9	45.3	53.8	60.3
3 hours	19.8	26	29.7	34.5	40.9	45.8
4.5 hrs	15.2	19.9	22.7	26.3	31.1	34.7
6 hours	12.6	16.4	18.7	21.7	25.6	28.5
9 hours	9.6	12.6	14.3	16.5	19.4	21.7
12 hours	8	10.4	11.8	13.6	16	17.8
15 hours	7	9.1	10.3	11.9	14	15.6
18 hours	6.2	8.1	9.2	10.6	12.5	13.9
24 hours	5.2	6.8	7.7	8.9	10.5	11.7
30 hours	4.5	5.9	6.7	7.7	9.1	10.1
36 hours	4	5.2	5.9	6.9	8.1	9
48 hours	3.3	4.3	4.9	5.7	6.7	7.4
72 hours	2.5	3.2	3.7	4.3	5	5.6

Co-efficient G : 0.00 F_2 : 4.29 F_{50} : 15.80

APPENDIX 2

DA Drawings

Proposed Site Stormwater Management Plans prepared by Cardno ITC

Document Title:	Document No:	Revision:
Legend, Abbreviations & Drawing Schedule	N09612-DA-H00	01
Site Plan	N09612-DA-H01	01

APPENDIX 3

DRAINS Model Results

Sizing of OSD system

DATA

DETENTION BASIN DETAILS

Name	Elev	Volume	Init Vol. (cu.m)	Outlet Type	K	Dia(mm)	Centre RL
osd	7.775	0	0	Orifice		310	7.775
	8	0.1					
	8.6	77					
	9	231					
	9.4	385					
	9.6	462					

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)
pre-dev cat	pre-out	1.3136	0	100	0	0	5	0
post-dev cat	osd	1.3136	90	10	0	0	5	0

Name	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %	Paved Rough	Grass Rough	Supp Rough
pre-dev cat	0.1	139.4	0.1	1	2.9	1	0.014	0.15	0.014
post-dev cat	139.4	139.4	0.1	2.9	2.9	1	0.014	0.15	0.014

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From
piped outlet	osd	post-out	10	7.775	7.675	1	Concrete, under roads	450	450	0.3	NewFixed	1	osd

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %
high level outlet	osd	post-out	1	9.26	1.2	1.6	Dummy	0.2	0.05	0.6	1	0

RESULTS - 5YR ARI

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
pre-dev cat	0.197	0	0.197	0.11	30.61	0.11	AR&R 5 year, 1 hour storm, average 52 mm/h, Zone 1
post-dev cat	0.535	0.521	0.016	5.14	26.35	0.09	AR&R 5 year, 25 minutes storm, average 82 mm/h, Zone

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
piped outlet	0.196	2.3	8.014	7.914	AR&R 5 year, 1 hour storm, average 52 mm/h, Zone 1

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
high level outlet	0	0	0.256	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
osd	8.94	208.5	0.196	0.196	0

DRAINS RESULTS - 20YR ARI

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
pre-dev cat	0.312	0	0.312	0.1	28.01	0.1	AR&R 20 year, 1 hour storm, average 68 mm/h, Zone 1
post-dev cat	0.701	0.679	0.026	4.64	24.26	0.08	AR&R 20 year, 25 minutes storm, average 106 mm/h, Zone 1

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
piped outlet	0.226	2.4	8.035	7.935	AR&R 20 year, 1 hour storm, average 68 mm/h, Zone 1

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
high level outl	0	0	7.665	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
osd	9.26	331.9	0.226	0.226	0

DRAINS RESULTS - 100YR ARI

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
pre-dev cat	0.455	0	0.455	0.09	25.66	0.09	AR&R 100 year, 1 hour storm, average 89 mm/h, Zone 1
post-dev cat	0.82	0.787	0.041	4.19	22.38	0.07	AR&R 100 year, 25 minutes storm, average 137 mm/h, Zone 1

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
piped outlet	0.244	2.4	8.049	7.949	AR&R 100 year, 1.5 hours storm, average 69 mm/h, Zone 1

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
high level outl	0.207	0.207	7.665	0.046	0.03	13.25	0.61	AR&R 100 year, 1.5 hours storm, average 69 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
osd	9.49	418.3	0.451	0.244	0.207