1-7 Anderson Avenue
& 12 El Alamein Avenue
Liverpool NSW

Stormwater Management Report

Revision	Date	Description	Author	Reviewer	Approved
P1	15/08/19	Preliminary Issue	IY	-	-
P2	12/11/19	Development Application Issue	IY	SF	MS
P3	05/12/19	Development Application Issue	IY	SF	MS
P4	28/08/20	Development Application Issue	IY	SF	MS
P5	08/09/20	Development Application Issue	IY	SF	MS

The reader's attention is drawn to the following important information:

Contents

Introduction

Aim of Report

This Stormwater Management report outlines the conceptual design of stormwater drainage proposed for residential development at 1-7 Anderson Avenue & 12 El Alamein Avenue, Liverpool and has been prepared for BlueCHP Limited. The objective of this report is to demonstrate the proposed management of stormwater will be in a manner consistent with the objectives of the local regulatory authority assessing the associated application for development works.

Limitations

The design approach for the stormwater drainage service is based upon documentation provided by Kennedy Associates Architects and relevant consultants associated with the project.

This report does not incorporate any requirements of the project that may be imposed as part of subsequent planning conditions unless explicitly stated.

Applicable Documents

It is assumed that the following standards will be applicable throughout the project:

- National Construction Code Building Code of Australia 2019;
- New South Wales Statutory Regulations;
- Relevant Australian Standards including but not limited to AS 3500.3

Sources of Information

This report is based upon the information available from the project brief and subsequent correspondence, meetings and available existing information/drawings ascertained from the Client and non-intrusive site inspections.

This report shall be read in conjunction with the erbas™ conceptual design drawing package issued with this report.

Description of the Project

The project comprises the consolidation of 5 existing residential lots (No 1, 3, 5 & 7 Anderson Avenue & 12 El Alamein Avenue) to construct a five-level residential flat building.

Key Areas of Design

The stormwater concept design drawings have been prepared to address the following key areas:

1. Local flooding effects
2. Existing underground street drainage
3. On-Site Detention storage
4. Rainwater storage
5. Stormwater quality
6. Temporary Erosion & Sediment control measures

Reference is made to the following relevant Council documents.

- Liverpool City Council – Liverpool Development Control Plan 2008 Part 1 – General Controls for all development
- Liverpool City Council – On-Site Stormwater Detention Policy

The Existing Site

The existing site comprises five existing residential lots and has a total area of 3348m2. It fronts two street corners at the intersections of El Alamein Avenue (west side of site), Anderson Avenue (south side of site) and Hillier Road (east side of site). The adjacent existing street gutters direct surface flow north beside the western and eastern frontages, and east beside the southern frontage. The approximate site location has a yellow outline in the aerial photograph below (Figure 1).

FIGURE 1 – Site Location viewed in three-dimensional aerial photograph

The survey plan prepared by YSCO Geomatics – Reference 10216 – dated 14/12/2016 indicates Australian

Height Datum (AHD) site surface levels ranging from a localised high point of about RL17.30 in the southwest corner down to about RL15.70 near the eastern boundary. The average site slope is observed to be about 1.6%, which presents a fall of about 1.6m over an approximate site length of 100 metres. The survey plan below (Figure 2) indicates the approximate natural direction of fall with blue arrows.

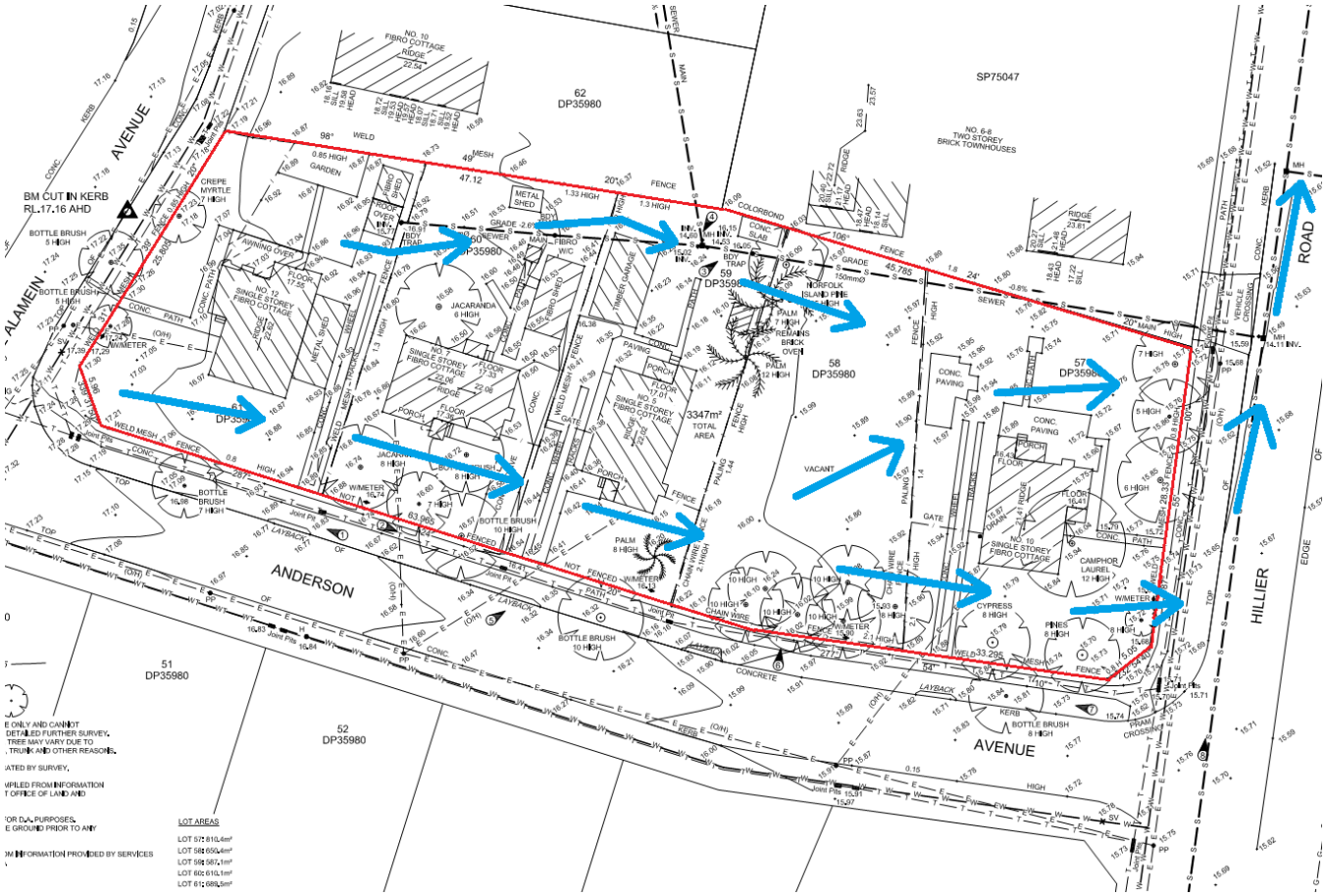


FIGURE 2 – Site survey & direction of surface fall

The photograph below (Figure 3) indicates the existing intersection of El Alamein Ave & Anderson Ave.

FIGURE 3 – Southwest corner of existing site

The image below (Figure 4) indicates the existing intersection of Anderson Ave & Hillier Rd.

FIGURE 4 – Southeast corner of existing site

Local Flooding Effects

Based on the Liverpool City Council's online mapping (ePlanning) portal at https://eplanning.liverpool.nsw.gov.au/Pages/lcc.maps/maps.aspx
the subject property at 1-7 Anderson Ave & 12 El Alamein Ave Liverpool is not considered to be completely inundated by flooding, but low risk flood extents are indicated along the eastern side of the development site (see Figure 5 below).

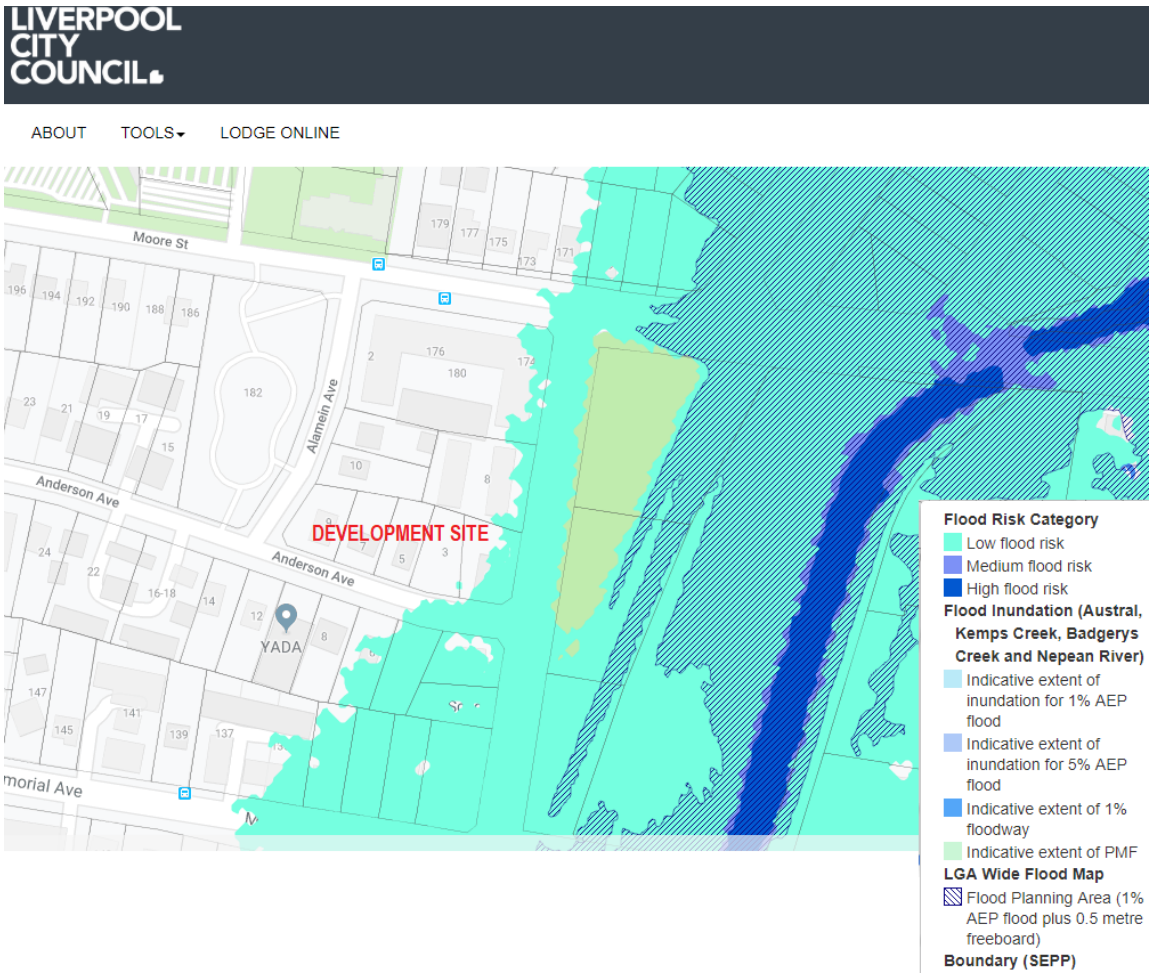


FIGURE 5 – Flood risk and flood planning map extracts

Council email advice was obtained on 5 August 2019 indicating that the subject site is not subject to flood related development controls (see Figure 6 below).

From: Maruf Hossain <HossainM@liverpool.nsw.gov.au>
Sent: Monday, 5 August 2019 9:42 AM
To: Isaac Yip <Isaac.Yip@erbas.com.au>
Subject: RE: Pre-DA Reference Number PL-120/2018 : 1-9 Anderson Ave Liverpool

Hi Isaac,

Thank you for your enquiry. The site is not subject to flood related development controls as it is located above the flood planning area.

For stormwater system design and OSD requirements please contact Land Development Engineer. I am copying this email to Mr Charlie Caraballo, Coordinator Land Development.

Regards,
Maruf

Maruf Hossain
Coordinator Floodplain and Water Management

LIVERPOOL CITY COUNCIL

02 8711 7650 | 0419 985 217 | HossainM@liverpool.nsw.gov.au
Customer Service: 1300 36 2170 | 3 Hoxton Park Rd Liverpool, NSW 2170, Australia
www.liverpool.nsw.gov.au

From: Isaac Yip <Isaac.Yip@erbas.com.au>
Sent: Monday, 5 August 2019 9:14 AM
To: Maruf Hossain <HossainM@liverpool.nsw.gov.au>
Subject: Pre-DA Reference Number PL-120/2018 : 1-9 Anderson Ave Liverpool

Hi Maruf

We have been engaged to prepare DA stormwater concept drawings for 1-9 Anderson Ave Liverpool.

The Council minutes of a predevelopment meeting are attached (issued 14 FEB 2019 for a meeting held on 5 DEC 2018).

Could you tell me if Council still provides local flood contour advice for the 1% AEP storm?

I think it may be relevant on the eastern side of our development site (intersection of Hiller Rd & Anderson Ave).

If you're not able to assist with any advice, would you be able to direct me to a relevant Council engineer for further information?

FIGURE 6 – Council email advice regarding flooding controls

Existing Underground Street Drainage

A previous proposal to discharge stormwater to a bus transit lane on the east side of the site was not approved by the Roads and Maritime Services authority. Based on a subsequent inspection of the site undertaken on 20 August 2020 and additional survey plan information, it was observed that existing underground street drainage is located to the north of the site along Moore Street. The part survey plan below (Figure 7) indicates a number of existing street pits near the intersection of Hillier Road and Moore Street.

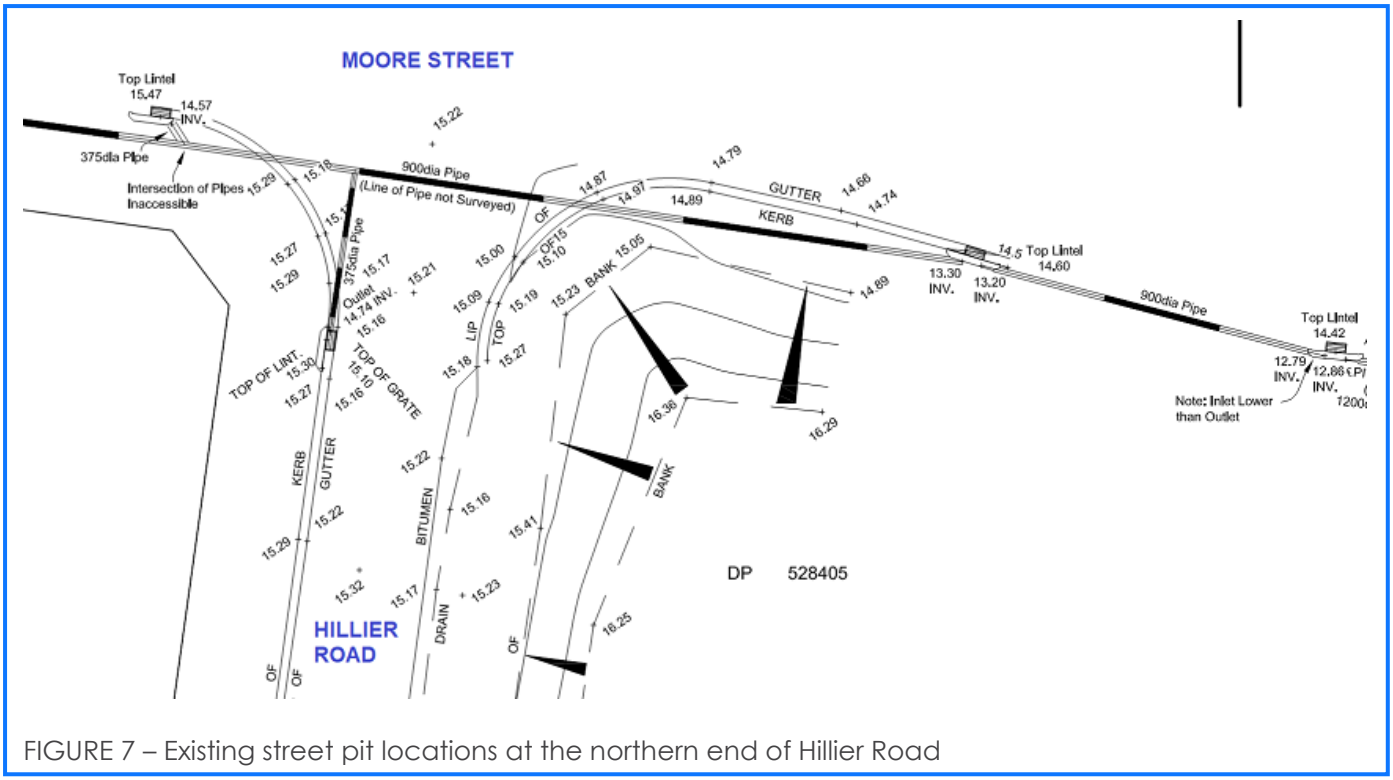


FIGURE 7 – Existing street pit locations at the northern end of Hillier Road

It is proposed that site drainage from the new development will be directed in an easterly direction across Hillier Road and then toward the north, connecting to the existing drainage system in Moore Street.

The Liverpool Council plan below (Figure 8) shows the assumed existing route of (blue) stormwater drainage lines in the vicinity of the site.

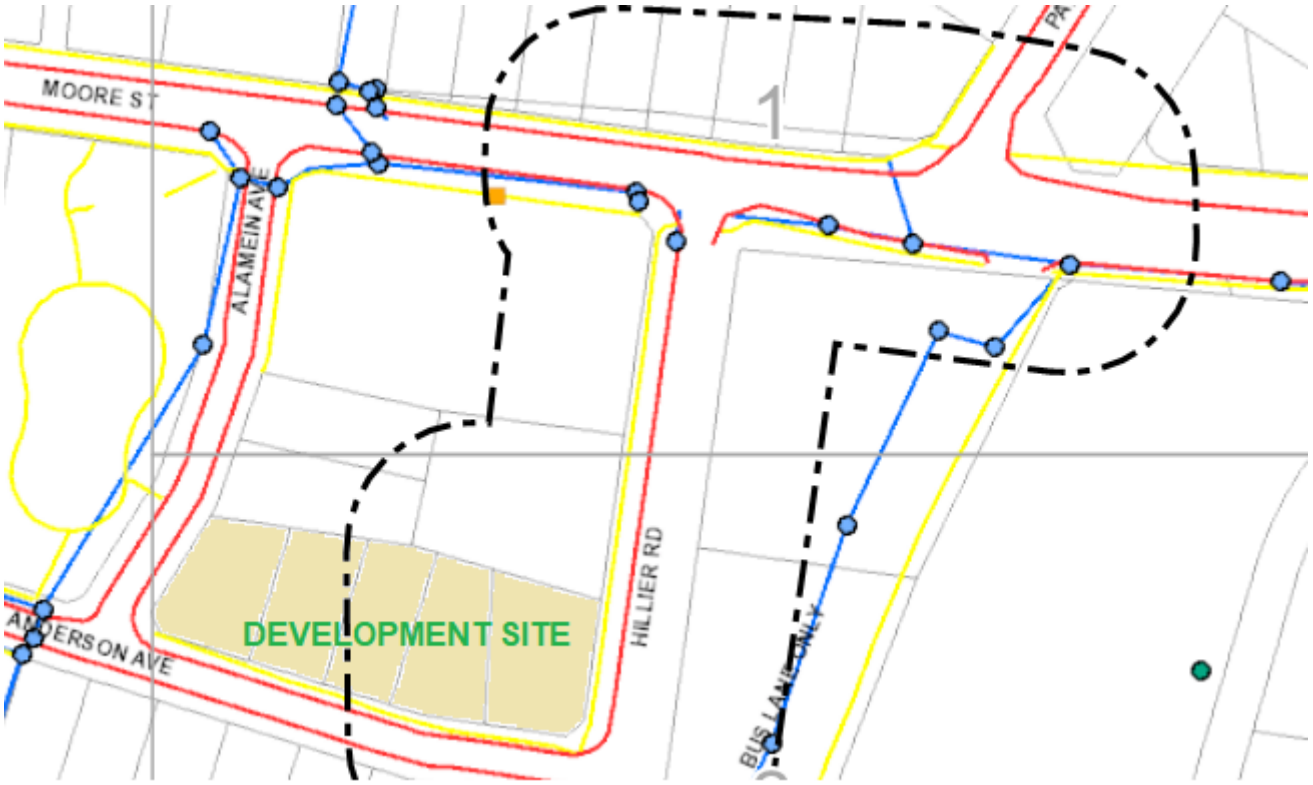


FIGURE 8 – Council plan record of stormwater pit and pipe locations

On-Site Detention Storage

Based on the Liverpool City Council – On-Site Stormwater Detention Policy (see extract in Figure 9 below), the subject site is required to address on-site detention storage requirements, since the impervious area is being increased.

POLICY STATEMENT

1. This On-Site Stormwater Detention (OSD) Policy shall be read in conjunction with Liverpool City Council's:

- Floodplain Management Plan,
- On-Site Stormwater Detention Technical Specification, and,
- Development Design and Construction Specifications (as amended)

2. OSD shall apply to all developments where any of the following situations occur:

- Where there is an existing stormwater system that is unable to cater for the increase in discharge due to development;
- When the development will involve an increase in impervious area on the site.
- Where it is intended to connect stormwater directly to the street kerb and gutter only and the discharge for the 1:10 year storm exceeds 20 litres per second for the 1 in 10 year ARI.

Calculations shall account for the total development site area. Types of developments where OSD may be applicable include (but are not restricted to) multi unit/dwelling residential development, single dwelling additions, dual occupancies, industrial and commercial developments and redevelopment of lands where Council feels the development is likely to produce increase in stormwater runoff and adverse impacts to the neighbouring properties.

FIGURE 9 – Council general requirement for On-Site Detention

Using DRAINS software as distributed by Watercom, modelling of the existing and proposed flows from a development area of 0.3348 hectares was undertaken, with 27% existing impervious proportion increasing to 69% proposed impervious proportion for a range of statistical frequencies and storm durations. The modelling analysis was undertaken to determine the minimum storage volume requirement necessary to demonstrate that postdevelopment flows will not exceed predevelopment flows. An allowance for some submergence has been incorporated in the calculations which assumes 60% of the existing pipe depth is flowing full during severe storm events.

The table below (Figure 10) provides a summary of flows and water levels derived from the DRAINS software model. For each Average Recurrence Interval (ARI), the green column proposed flow values must be no higher than the corresponding yellow column existing flow values.

STORMWATER DETENTION CALCULATION SUMMARY

Project: 1-7 ANDERSON & 12 EL ALAMEIN AVENUE, LIVERPOOL

Effective detention storage up to RL 15.67 (lowest connected grate)

	5 YEAR ARI or 20% AEP					20 YEAR ARI or 5% AEP					100 YEAR ARI or 1% AEP					
Storm Duration	Existing Runoff L/s	Detained Flow L/s	Overflow L/s	Total Outflow L/s	Max Water RL m	Existing Runoff L/s	Detained Flow L/s	Overflow L/s	Total Outflow L/s	Max Water RL m	Existing Runoff L/s	Detained Flow L/s	Overflow L/s	Total Outflow L/s	Max Water RL m	
5min	39	19		19	15.047	71	23		23	15.162	112	25		25	15.270	
10min	54	23		23	15.188	95	25		25	15.340	137	28		28	15.516	
15min	58	23		23	15.246	93	27		27	15.433	125	30		30	15.657	
20min	51	24		24	15.272	86	27		27	15.476	115	30	82	112	15.879	max
25min	50	24		24	15.278	77	27		27	15.497	117	30	69	99	15.855	
30min	51	24		24	15.272	71	27		27	15.517	104	30	58	88	15.815	
45min	47	24		24	15.279	59	27		27	15.489	94	29	51	80	15.811	
1.0hr	37	23		23	15.216	68	26		26	15.457	77	29	42	71	15.773	
1.5hr	30	22		22	15.149	43	25		25	15.384	68	30	9	39	15.697	
2.0hr	33	21		21	15.107	44	24		24	15.290	65	29		29	15.649	
	Q5										Q100	<= Q5		<= Q100		

ORIFICE DIAMETER =	117	mm
MINIMUM INTERNAL TANK AREA =	135	m2
REQUIRED STORAGE VOLUME =	99	m3
SITE AREA =	3348	m2
EXISTING IMPERVIOUS PROPORTION =	27	%
PROPOSED IMPERVIOUS PROPORTION =	72	%
ASSUMED PIT SUBMERGENCE LEVEL RL =	14.17	(approx 60% of full pipe depth)

FIGURE 10 – Detention Flow & Depth Calculation Summary

In accordance with the DRAINS model detention storage analysis, a minimum 99m3 detention tank is proposed to be constructed below the paved and landscaped area on the Hillier Road (east) side of the development site.

Rainwater Storage

Reference is made to the Liverpool City Council – Liverpool Development Control Plan 2008 Part 1 – General Controls for all development – Section 22 Water Conservation. Rainwater storage requirements for new residential dwellings are typically provided to satisfy State Environmental Policy Building Sustainability Index (BASIX) assessment requirements. The extract below (Figure 11) indicates the Council requirement for BASIX compliance.

22. Water Conservation

Applies to

This section applies to all development involving the use of water.

Background

Building design can contribute to environmental sustainability by integrating measures for improved water quality and efficiency of use. Water can be conserved in a number of ways, including; reducing water demand from the mains and re-using water, which would otherwise be lost as run off or waste water.

By integrating water use efficiency, water collection and water reuse measures into building and associated infrastructure design development can contribute to environmentally sustainable outcomes.

All mains water is treated to drinking water standard. However, only about 1% of domestic water consumption is actually used for drinking.

Uses such as toilet flushing, laundry and outdoor uses do not require water to be treated to such a high standard. Such uses can be satisfactorily supplied using rainwater collected from roofs and stored in tanks. Benefits include significant water cost savings and substantial reductions in stormwater discharges.

Objectives

a) To reduce per-capita mains consumption of potable water.

b) To harvest rainwater and urban stormwater runoff for use.

c) To reduce wastewater discharge.

d) To capture, treat and reuse wastewater where appropriate.

e) To safeguard the environment by improving the quality of water run-off.

f) To ensure infrastructure design is complementary to current and future water use.

Controls

Residential

New dwellings, including a residential component within a mixed-use building and serviced apartments intended or capable of being strata titled, are to demonstrate compliance with *State Environmental Planning Policy – Building Sustainability Index (BASIX)*.

Non-Residential

1. Development or redevelopment under the $1 million threshold of control 2 shall:
   - Installed water fixtures (shower heads, taps, toilets, urinals, etc.) are to be 3 stars under the WELS system or better rated.

FIGURE 11 – Council's general water conservation requirement

BASIX assessment as advised by Gradwell Consulting indicates that no rainwater storage is required to achieve compliance for the subject development, provided reticulated alternative water supply is sourced from a proposed Hoxton Park system.

Stormwater Quality

Reference is made to the Liverpool City Council – Liverpool Development Control Plan 2008 Part 1 – General Controls for all development – Section 6 Water Cycle Management.

The extract below (Figure 12) indicates that certain stormwater pollutants levels are to be reduced by the stated percentage values.

6.4 Stormwater Runoff Quality

Applies to

This sub-section applies to all development except for development applications for single dwelling houses and dual occupancy housing.

Background

Waterbodies in urban or agricultural areas usually, suffer from decreased water quality. This adversely impacts on the biodiversity of the waterbody and the use of watercourses by humans.

Objectives

a) To ensure that stormwater runoff is of suitable quality to protect the aquatic ecosystems of waterbodies within Liverpool and downstream receiving catchments.

b) To protect the aquatic environment of the Georges River catchment and the Hawkesbury Nepean River catchment.

c) To maintain and enhance freshwater and estuarine ecosystems, including biodiversity, relative abundance and ecological processes.

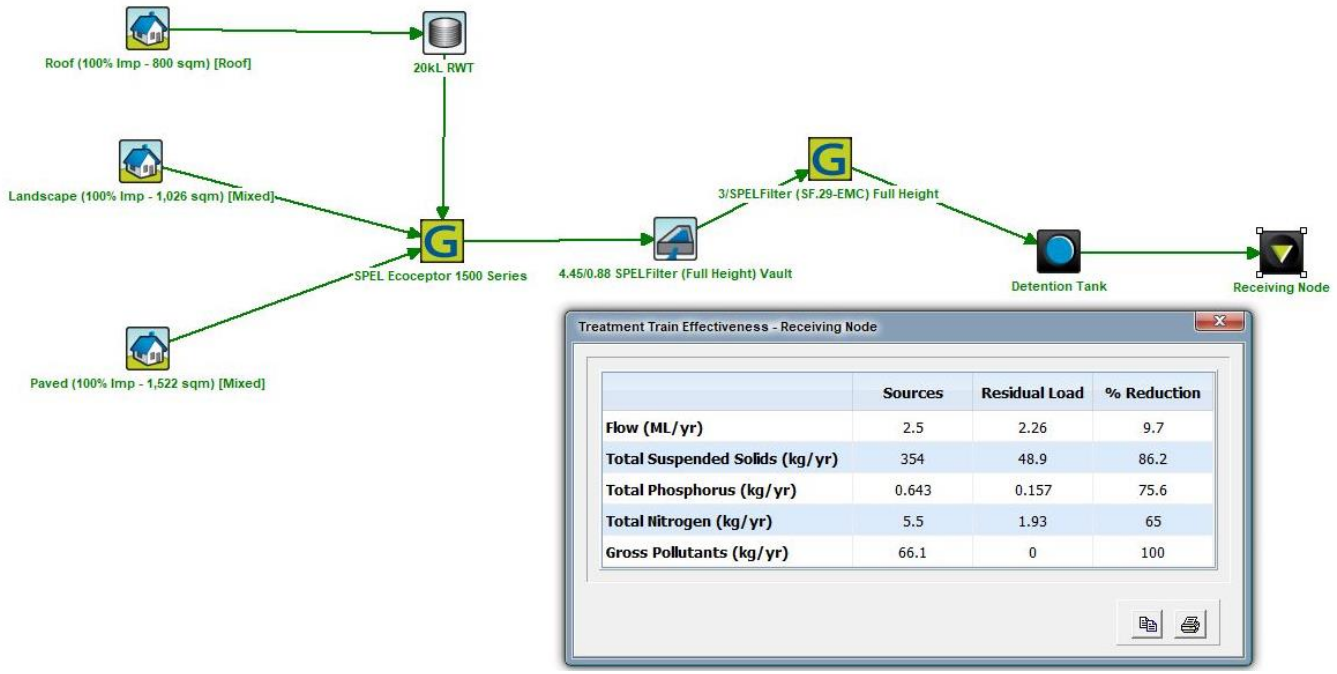
Controls

1. The post development water quality shall be reduced to the following targets when compared to pre development water quality:
   - 45% reduction in the mean annual load of total nitrogen.
   - 45% reduction in the mean annual load of total phosphorus.
   - 80% reduction in the mean annual load of total suspended solids.
2. In the case of areas were council has adopted a master plan or in Part 2 specifying water quality targets. The requirements of those documents shall be utilised in preference to the targets listed above.
3. In the case of green field developments where Council has not adopted a master plan or is not included in Part 2 of the DCP specifying water quality targets the above targets shall be utilised by comparing post development water quality with that of a conventional stormwater drainage design without water quality treatment for an urbanised development.

FIGURE 12 – Council stormwater quality requirements

Appropriate proprietary stormwater quality improvement devices are proposed to be installed in conjunction with the stormwater drainage system in order to achieve the required performance values.

Stormwater quality improvement devices are typically selected to satisfy the relevant pollutant target performance criteria as demonstrated by a software package known as MUSIC (Model for Urban Stormwater Improvement Conceptualisation). A screenshot of this analysis is included below (Figure 13) to demonstrate the proposed performance characteristics of the treatment system will meet the required pollutant targets. A rainwater tank was initially assumed for the roof catchment, but BASIX assessment indicates this tank is not actually required.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	2.5	2.26	9.7
Total Suspended Solids (kg/yr)	354	48.9	86.2
Total Phosphorus (kg/yr)	0.643	0.157	75.6
Total Nitrogen (kg/yr)	5.5	1.93	65
Gross Pollutants (kg/yr)	66.1	0	100

FIGURE 13 – MUSIC Model Results

In order to achieve the indicated pollutant reduction values a SPEL Ecoceptor and a SPEL Filter Chamber containing three cartridges are proposed for installation. Sample images of these products are included below (Figure 14).

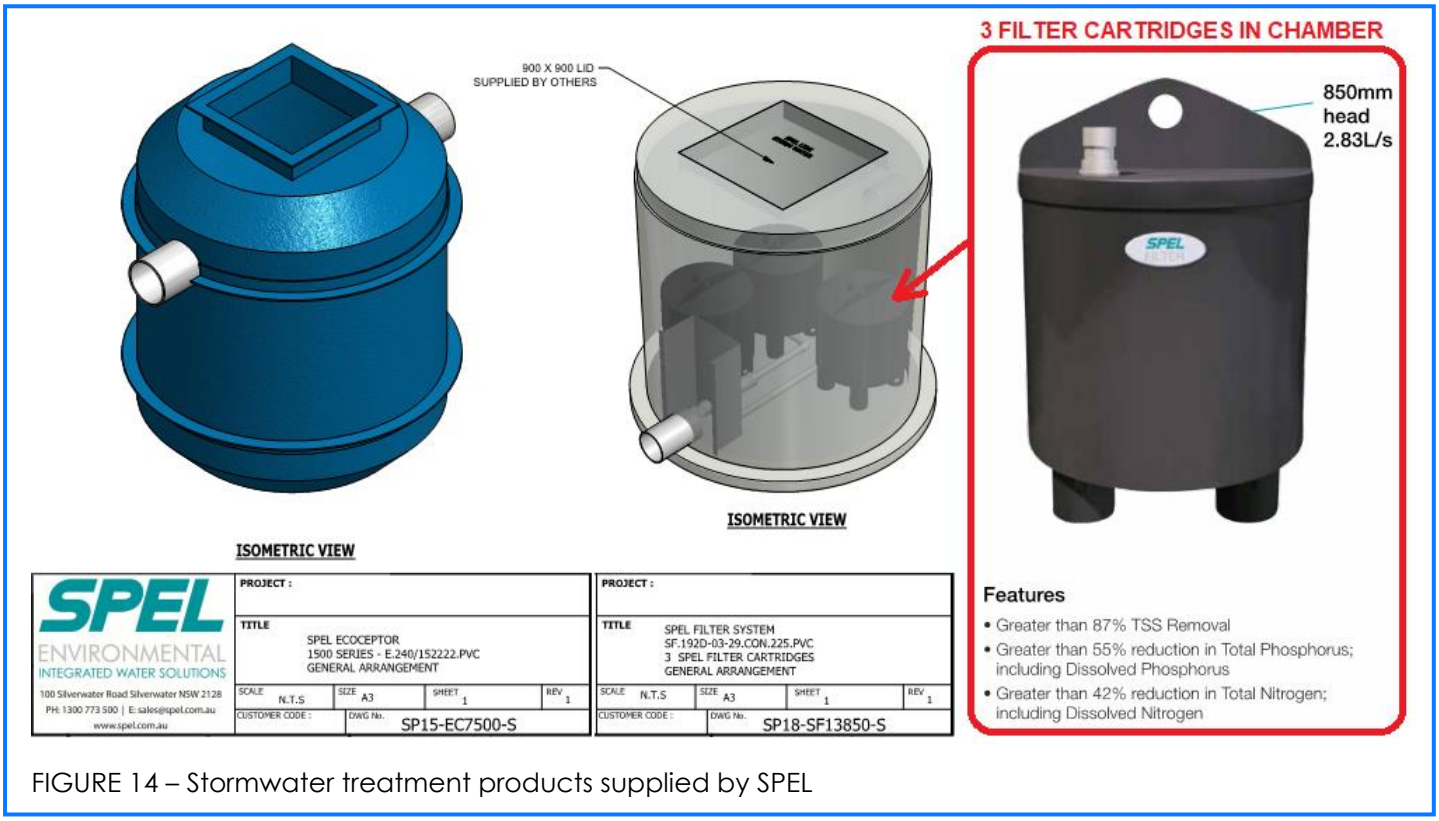


FIGURE 14 – Stormwater treatment products supplied by SPEL

Temporary Erosion & Sediment Control Measures

Reference is made to the Liverpool City Council – Liverpool Development Control Plan 2008 Part 1 – General Controls for all development – Section 8 Erosion and Sediment Control. During construction works the management of soil and water movement requiring erosion and sediment control is to be undertaken in accordance with the Landcom publication Soils and Construction: Managing Urban Stormwater 4th Edition, March 2004 (also known as "the Blue Book"). Refer to extract (Figure 15) below.

8. Erosion and Sediment Control

Applies to

This section applies to all development, which may involve:

a) Clearing, levelling, shaping, excavation of the existing soil surface and or vegetation on any site or the placement of any material stockpiles on that site;

b) Placement of any fill upon a site; and

c) Changes in the rate and or volume or course of runoff entering a waterbody, or overland flow.

Background

The excavation of land removes ground cover and often results in stockpiling of loose soil. This has the potential to create erosion of soils on site and sedimentation downstream from a development site. The sedimentation can result not just on adjoining land or streets but on creek and river systems quite some distance away. The impact on the ecosystem of creeks and rivers can be very significant.

Objectives

a) To avoid soil erosion through the use of effective erosion and sediment control measures both during and following any works.

b) To reduce pollution by avoiding land degradation and disturbance of vegetation on site, hence reducing pollution impact to downstream areas and receiving waters and their ecosystem.

c) To minimise costs involved in unblocking drains and water bodies, cleaning of roads and compensating for the loss of topsoil through improved sedimentation and erosion control.

d) To improve water quality by reducing sedimentation.

Controls

1. The development application shall be accompanied by either a Soil and Water Management Plan (SWMP) or an Erosion and Sediment Control Plan (ESCP) as shown in Table 1.

Table 1 Plans for stormwater soils management

Plan Required	Area of Disturbance
ESCP	Up to 2,500sqm
SWMP	Greater than 2,500sqm and/or where development consent is required.

2. These plans shall be prepared in accordance with *Managing Urban Stormwater Soils and Construction*, also known as the *Blue Book* (current edition) produced by the *NSW Department of Housing*. The plans should form part of the engineering design drawings and be documented in the construction plans.

3. The SWMP and ESCP are to include the following:
   - A set of plans drawn to scale which show the layout of appropriate sedimentation and erosion control in accordance with the requirements of this DCP;
   - Outline of appropriate sedimentation and erosion control measures;
   - Proposed control of erosion and sedimentation shall be prepared by referencing and incorporating the requirements of Council's *Specification for Control of Erosion and Sedimentation.*

FIGURE 15 – Council Erosion & Sediment Control requirements

Corresponding erosion and sediment control details are provided on the stormwater drainage drawings.

Temporary construction measures to be undertaken include:-

- Sediment fencing on the low side of earthmoving operations;
- A gravel layer at the construction vehicle access point into the area of works
- Regular monitoring of soil movement characteristics and cleaning of sediment deposits as required during construction
- Security fencing around the area of construction works

Conclusion

This Stormwater Management Report for the proposed residential unit development at 1-7 Anderson Avenue & 12 El Alamein Avenue Liverpool identifies and addresses the following items relating to anticipated engineering assessment by Liverpool City Council :-

- Mainstream flooding effects are not considered to be applicable to the site of proposed works;
- Existing street drainage to the north of the site provides the opportunity for an underground stormwater connection (subject to Council approval);
- On-site detention is proposed to address Council requirements in relation to increased impervious site area;
- BASIX assessment indicates that no rainwater storage is required to achieve the required water conservation target for this development;
- Stormwater treatment is to be provided with a SPEL Ecoceptor and three filter cartridges; and
- Erosion and sediment movement is to be controlled during construction with suitable measures to prevent undesirable soil deposits around the works area.

Sydney
Level 1,
15 Atchison Street
St Leonards NSW 2065
+612 9437 1022

Melbourne
Level 3,
116 Hardware Street
Melbourne VIC 3000
+613 8648 6538

Manila
Level 24, Union Bank Plaza
Meralco Avenue Ortigas Center,
Pasig City Philippines 1605

general@erbas.com.au
erbas.com.au