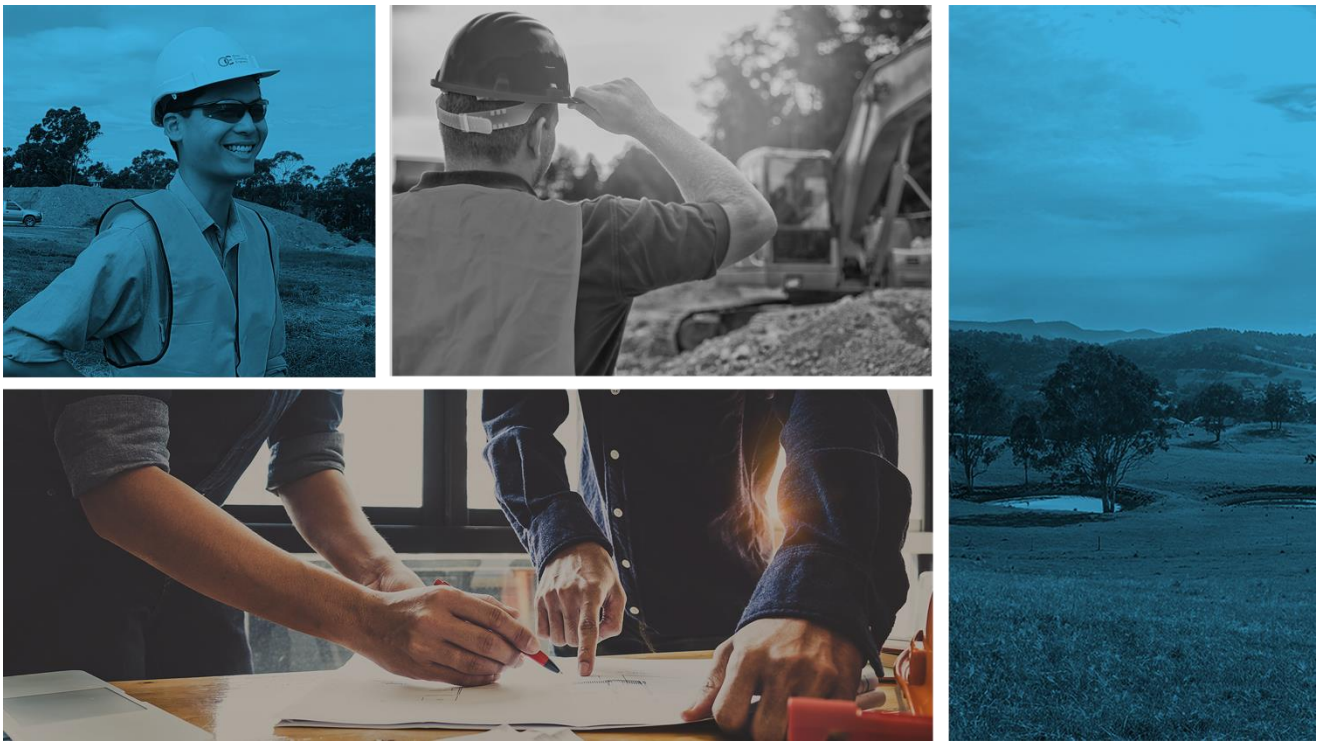
Orion Consulting
orionconsulting.com.au
info@orionconsulting.com.au
(02) 8660 0035

Landen Property Group P/L

Stormwater Management Report

Lot 6 D.P. 229296
Garfield Road East
Riverstone



30 July 2021 | Landen Property Group P/L | Revision A

Commercial in Confidence

Contact

Orion Consulting Engineers Pty Ltd

ABN 25 604 069 981
Suite 4.04, No. 12 Century Circuit
Baulkham Hills NSW 2153

P: 02 8660 0035
E: info@orionconsulting.com.au

Prepared by:

Phillip Stoddart
Senior Civil Design Engineer

Effective Date: 03rd August 2021

Approved by:

Mariano Polisciuk
engineering Design Manager

Effective Date: 03rd August 2021

Document Control

Revision	Prepared	Reviewed	Approved	Date	Description	Project Reference
A	Phillip Stoddart	Nathan Gundlach	Phillip Stoddart	03 August 2021	First Issue	21-0126

Table of Contents

List of Tables

List of Figures

1 Introduction

1.1 Site Description

The subject site is located within the Blacktown City Council (BCC) LGA, approximately 1.5kms along Garfield Road East, west of Windsor Road and within the BCC Contribution Plan No.22L Rouse Hill (Land) catchment area. The proposed development by Landen Property Group P/L (LPG) comprises of approximately 2.38 hectares in area with site extents shown in the figure below.

Figure 1 - Lot 6 DP229296 Garfield Road East (Imagery courtesy of Nearmap ©)

The site is zoned R2 (Low Density Residential) with Clarke Street zoned RE1 (Public Recreation) and Garfield Road East zoned SP2 (Infrastructure). Lot 5 DP 229296 to the southeast of the subject site is zoned E4 (Environmental Living). The General Arrangement Plan within the Orion Consulting (OC) drawing set contains a zoning overlay for reference. The site is primarily lightly vegetated rural farmland containing a dilapidated house and shed structures.

Garfield Road East is subject to a future upgrade by Transport for New South Wales (TfNSW) at which time, Clarke Street will be modified such that it no longer intersects with Garfield Road East and will not continue south beyond the subject site property line (NSW Government Schedule 8 Riverstone East Precinct - Development Control Plan 2010, May 2010).

BCC has advised there are regional stormwater detention basins and water quality treatment devices planned to be constructed both on the northern side of Garfield Road East and on the western side of Clarke Street.

A Development Application (DA) has been made previously for this site by L&R Patri Pty Ltd and have since lodged an appeal with the Land and Environment Court. A Statement of Facts and Contentions (SOFAC) was tabled at a Section 34 Conference held on 10 June 2021. This
report has been prepared to address the resulting stormwater related issues.

1.2 The Proposed Development

The proposed development consists of 32 residential lots to be constructed in two stages to facilitate the construction of temporary stormwater management devices.

A Water Cycle Management Report was prepared by Mott MacDonald (May 2016) and identifies the north-west corner of the site as flood affected in a 1 in 100 year Average Recurrence Interval event. During the S34 Conference BCC have advised that the future upgrade of Garfield Road East will include an upgrade to the existing culvert system which will alleviate the current flooding affectation, however those works are not scheduled to be undertaken for an undetermined number of years.

The stormwater system designed to support this DA is required to meet BCC's objectives for,

1) Water Quality,
2) Stormwater Detention, and
3) Floodplain Management.

Ultimately all three of these criteria will be managed by the Garfield Road East Upgrade and the regional detention and water quality devices to be constructed by BCC. However, in order to release some lots prior to this infrastructure being constructed it is necessary to adopt a staged approach and manage these elements with temporary measures within the site.

1.3 Objectives

The BCC WSUD Developer Handbook (the Handbook) outlines the required objectives for

- Water Quality, and
- On-Site Detention.

BCC advised in the SOFAC that the proposed development was not permitted to raise adjoining flood waters by more than 20mm.

The purpose of this report is to demonstrate compliance of the design with the performance requirements set by the Handbook on these elements.

2 Water Quality Design

2.1 Water Quality Controls

Council's requirements for pollutant removal are listed in the Handbook and reproduced in Table 1 shown below.

Table 1 - Required Pollutant Removal Targets

Pollutant	% Post Development Pollutant Reduction Targets
Gross Pollutants (GP)	90
Total Suspended Solids (TSS)	85
Total Phosphorous (TP)	65
Total Nitrogen (TN)	45
Total Hydrocarbons	90

2.2 Water Quality Treatment Devices

In the future regional rain gardens will provide water quality treatment to this site. Until such time as these become active it is necessary to treat all stormwater runoff to remove pollutants within the targets specified shown in the table above.

It is proposed to achieve the water quality targets by means of a rainwater re-use tanks and a raingarden located within the temporary On-Site-Detention (OSD) basin.

A temporary turning head is proposed adjacent to Garfield Road East which due to level incompatibilities with the OSD design is unable to be drained to the raingarden. This was initially modelled as bypass, but it was found that the TSS removal target was not met and could not be compensated for by increasing the raingarden area. A single OcenaGuard pit insert was included in to treat the temporary section of road and all pollutant removal targets were met.

Performance of the water quality devices was determined using the E-Water software programme MUSIC including MUSIC-LINK adopting BCC standard parameters and rainfall data. The rainwater tanks, raingarden and OceanGuard Pit inserts have been modelled in accordance with the parameters as specified in the Handbook.

2.3 Water Quality Design - Results

The table below contains a summary of the MUSIC model output demonstrating compliance with the required objectives. Copies of the electronic MUSIC models have also been included with the submission to Council for their review of the model details.

Table 2 - MUSIC model results summary

Pollutant	GP	TSS	TP	TN
% Post Dev Reduction Targets	90	85	65	45
Interim Water Quality Results	99.1	85.4	67.9	60.8

3 On-Site Detention

The subject site is located within the Riverstone East growth Centre and will ultimately have regional infrastructure built to provide OSD to the development. However, prior to the regional basins being constructed it will be necessary to provide a temporary OSD basin on-site.

The OSD basin was designed using 'Council's Deemed to Comply' spreadsheet. A copy of the results is included within the Orion Consulting Engineering Plans.

4 Flood Management

The Mott MacDonald Water Cycle Management Plan identifies that the northern end of the site is currently subject to flood affection during a 1% Annual Exceedance Probability (1%AEP) event as shown in the figure below.

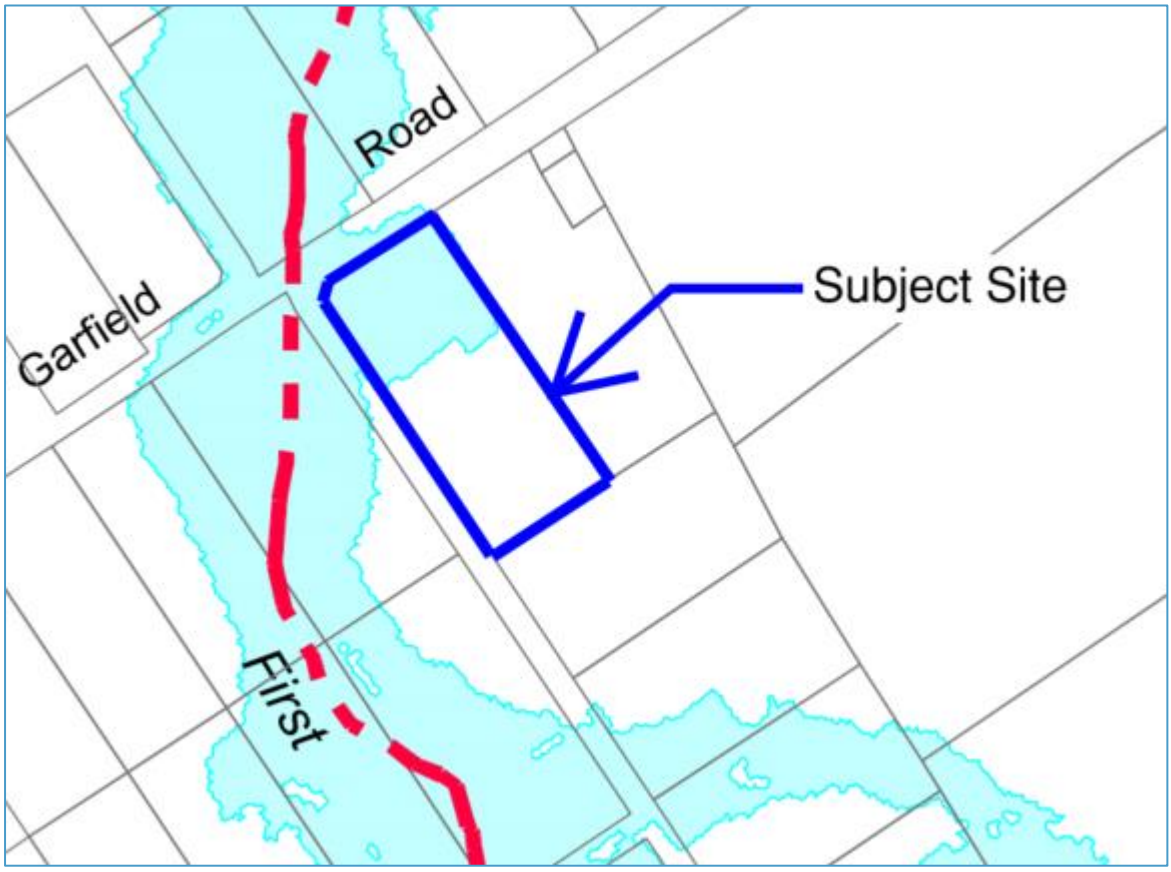


Figure 2 - 1%AEP Flood affectation on Lot 6 DP229296 Garfield Road East (Mott MacDonlad WCMP)

The proposed development requires that the existing levels in Clarke Street be lifted to ensure that the future lots are not subject to flood affectation during a 1% Annual Exceedance Probability (1%AEP) event and in order to drain stormwater to the temporary OSD basin. A temporary flood storage area has been designed to offset the loss in floodplain that occurs due to the increase in road levels. Floodwater enters the storage area by,

1) Overland flow around the north-western corner of the site,
2) By means of a balance pipe to be constructed within Clarke Street, and
3) Backfilling through the stormwater drainage system.

A temporary pipe connects the flood storage area to the road drainage system to allow the storage to drain as floodwaters subside.

BCC advised during in both the SOFAC and the S34 conference that the maximum allowable rise in 1%AEP flood levels is 20mm.

4.1 Methodology

In addition to the Mott Macdonald flood modelling, BCC has prepared a HECRAS model of First Ponds Creek. A copy of the hydrographs adopted in the HECRAS model were provided to Orion in an email from Eric Lin, dated 07/08/2019.

The HECRAS model prepared by Council is suited for modelling creek systems but is not suited for the proposed design involving a partially offset storage area and piped drainage system. Instead, the software program Tuflow was used which is capable of 2-dimensional surface flow analysis with connections to a 1-dimensional stormwater pipe system.

Peak flows were derived from the HECRAS data provided by Council and applied to a Tuflow model in both the pre and post development scenarios. A Manning's roughness factor of 0.025 was adopted for road areas and 0.08 adopted for all other areas within the model.

The resulting flood levels in the pre and post development cases were then compared to ensure no more than a 20mm increase in flood levels.

4.2 Flood Model Results

The Tuflow modelling demonstrates that the proposed development narrows the flood plan on approach to the existing culvert crossings in Garfield Road East. However, the addition of a flood storage area and associated drainage and balance pipes reduce the affect of this constriction such that increases in floodplain levels are for the most part within acceptable tolerances.

Flood mapping included in produced by Orion Consulting demonstrates that for the majority of the area modelled there is no increase above 20mm in 1% AEP flood levels between the predevelopment and post development conditions. However, there is a small, localised area directly opposite Lots 120 and 121 adjacent to the Clarke Street batter in which the flood levels are increased to 21-22mm, indicated in the red hatched area in the figure below.

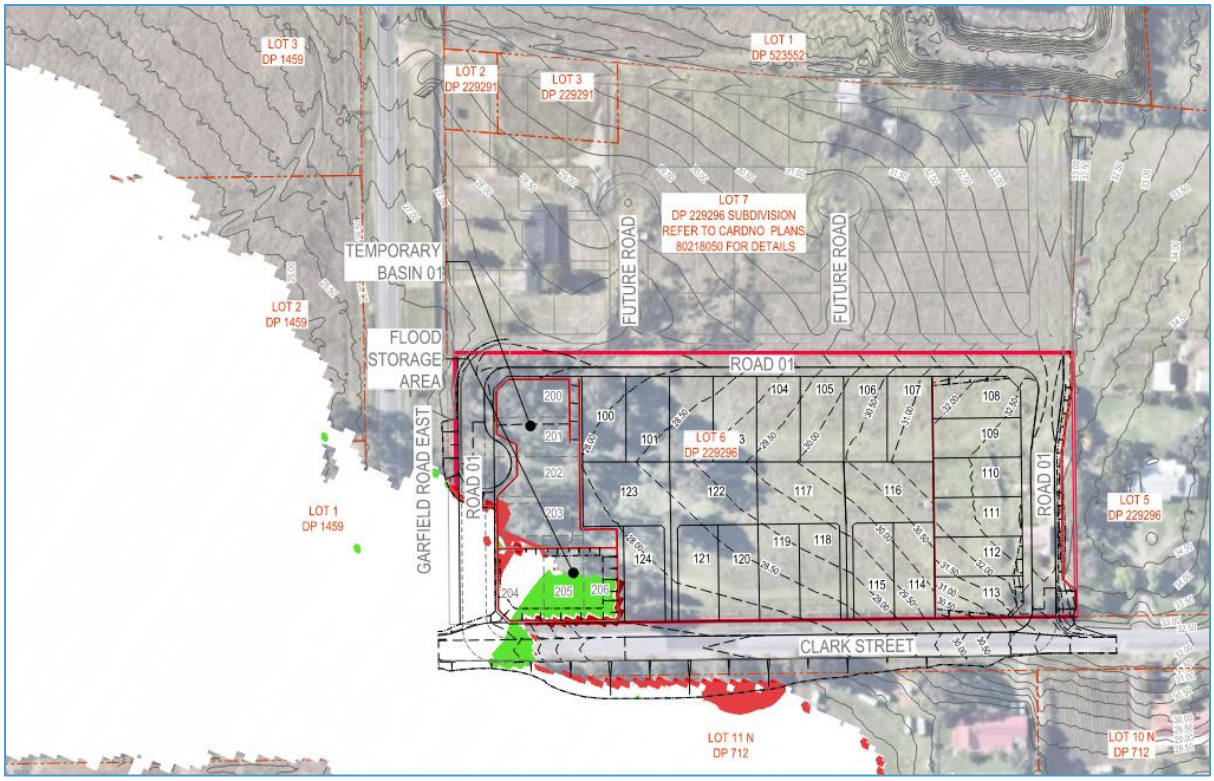


Figure 3 - Extract of Orion Consulting 1%AEP Flood Difference Map

Orion considers this result to acceptable for the following reasons,

1) The HECRAS model provided by BCC adopts peak flows rather the hydrographs and is therefore a conservative model.
2) The Tuflow model used in this assessment is based on a 2m x 2m grid and a difference of 1 to 2mm is considered to be within tolerance of the model.
3) The increase of 21-22mm is in an isolated location within land zoned RE1 which we understand Council to be in the process of acquiring for the purposes of constructing regional stormwater quality treatment devices and the consequence of an additional 2mm is inconsequential in this application.

5 Summary

This report has outlined the proposed stormwater treatment measures for the development by Landen Property Group P/L at Lot 6 DP 229296 Garfield Road East, Riverstone. The results above demonstrate the treatment measures will satisfy Council's performance requirements for Water Quality, On-Site Detention and Floodplain Management.

Treatment measures have been proposed both for the interim state, prior to the completion of the downstream regional devices, and the ultimate state demonstrating compliance with Council's performance requirements throughout all stages of the development.

6 References

Australian Rainfall and Runoff: A Guide to Flood Estimation, Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), Commonwealth of Australia (Geoscience Australia) 2019

NSW Government: Schedule 8 Riverstone East Precinct - Development Control Plan 2010, May 2010

WSUD Developer Handbook: MUSIC modelling and design guide DRAFT 2019

Blacktown City Council: "Engineering Guide for Development" 2005

Queensland Urban Drainage Design Manual, Third Edition, Queensland Government Department of Energy and Water Supply 2013

Mott MacDonald: "Water Cycle Management Report, Riverstone East", May 2016, Revision G

Using MUSIC in Sydney Drinking Water Catchment, WaterNSW 2019