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Goodman International

S75W Mod 5 Application

Oakdale Stage 1 Ropes Creek Tributary Flood Study Addendum

11 October 2012

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1. Introduction

1.1 Purpose of this report

This flood study report is an addendum to the flood study completed as part of the original Oakdale Concept Plan application. The previous flood study results were incorporated in the report titled Oakdale Water Sensitive Urban Design Strategy Report (GHD September 2010).

Since the Oakdale Concept Plan was approved Project Applications have been submitted and approved within the area known as the Central Precinct. A s75W amendment to the previous applications is now proposed (s75W Mod 5 Application). GHD have been requested to update the flood modelling for the Ropes Creek tributary that traverses the Central Precinct to incorporate the following in relation to the s75W submission:

- Works that have already been completed under previous approvals; and
- Proposed works such as the raising of Lot 1C, extension of the estate road and proposed bio-diversity basin adjacent to Lot 1C.

The purpose of the study is:

- to confirm the flood extents of the tributary in consideration of the works proposed as part of the s75W submission; and
- Confirm minimum Finished Floor Levels for facilities located adjacent to the tributary (namely Lots 1C, 2B and 3A).

2. Existing and Proposed Conditions

2.1 Existing Conditions

A recent topographic field survey has been carried out and forms the basis of the digital terrain model employed in the flood modelling of the tributary. The survey represents works carried out to date within the Central Precinct.

2.2 Modifications to Existing Topography

The latest survey model was augmented with the proposed terrain model that reflects the s75W amendments as detailed in the AT&L drawings (Oakdale Central – Stage 2, Estate Road Extension, Civil Works Package). Changes include the raising of lot pad 1C to its final level, the estate road extension (with associated culvert crossing), and proposed bio-diversity basin.

3. Analysis

3.1 Summary of Analysis Undertaken

Numerical modelling was carried out to determine existing condition flood peaks and flood levels for the Ropes Creek tributary for a range of design storm events (using RAFTS hydrologic model and TUFLOW hydraulic model).

3.2 Flood Simulation

Peak flows for Ropes Creek were simulated using the RAFTS hydrological model. The RAFTS model was updated to reflect works already undertaken in the Central Precinct as well as proposed works forming the s75W submission.

Compilation of the model included:

- Catchment discretisation;
- Hydrological parameter determination;
- Intensity-Duration-Frequency determination for generating storm rainfall events; and
- The RAFTS model was simulated for a range of design storms (5% AEP, 1% AEP, and Probable Maximum Flood) and durations ranging from 30 minutes to 9 hours. Simulations were undertaken for the undeveloped conditions based on the requirement for On-Site Detention for the development.
- Assumption of no increase in runoff (i.e. effective impermeable area) from the lots due to OSD requirements for the 5% AEP and 1% AEP design storms. Increased run-off was considered however for the modelling of the PMF event only.

Key parameters assumed in the RAFTS modelling are listed below in (Table 1). They are incorporated into the model in accordance with Australian Rainfall and Runoff (IEAust, 2000).

Table 1 Key RAFTS modelling parameters

	Pervious	Impervious
Initial loss (mm)	15	2
Continuing loss (mm/hr)	2.5	0

The updated catchment plan for the RAFTS model network is provided in Appendix A.

3.3 Hydraulic Modelling

Hydraulic modelling was carried out using TUFLOW (2 and 1 Dimensional free surface flow flood simulator) to model the flood extents. The existing TUFLOW model was updated to include the new proposed developments; in particular the addition of the estate road extension and its associated culvert crossing, the proposed bio-diversity basin and the raising of lot level 1C.

The flood extents corresponding to each event were modelled with this updated version of the model. The flood extent maps are included in Appendix B.

The model represents the surface terrain of major flow paths with a grid of 5 metre square cells. Hydraulic properties (chiefly Manning's n roughness values) were applied to each model cell based on land use type.

Adopted Manning's n values are tabulated in Table 2.

Table 2 Adopted Manning's n values

Land Use	Manning's n
Dense vegetation, flooded reaches	0.12
Dense vegetation	0.10
Medium vegetation	0.08
Light vegetation	0.05
Floodplain high grass	0.035
Floodplain short grass	0.03
Unsealed roads or exposed soil/sand	0.022
Sealed roads	0.017
Houses or fences areas (zero conveyance)	4

The proposed culverts were modelling as part of the 1D network using drawing details provided by AT&L (issue A, June 2012).

3.4 Flood Planning Levels

Finished floor levels should be set at a level 500mm above the adjacent tributary 1% flood levels, which is consistent with the flood planning requirements outlined in the Concept Oakdale Plan. The resultant finished floor levels for Lots 1C, 2B and 3A are summarised in Table 3.

Table 3 Finished Floor Levels

Lot	100-year Flood Level (mAHD)	Minimum Required Finished Floor Level due to Tributary Flooding (mAHD)	Proposed Pad Level (mAHD)
1C	62.0	62.5	66.26
2B	65.0	65.5	68.25
3A	60.2	60.7	64.17

The results show that the proposed pad levels (and hence the final floor levels) are above the 100-year flood extents including 500mm freeboard. The 100-year flood extents of the tributary do not encroach onto the proposed pads.

It is noted that there is internal subdivision stormwater infrastructure such as piped systems, channels and overland flow paths that have to also be considered when setting pad levels. These constraints have been considered in the detail design of the internal stormwater infrastructure. As a result, the proposed pad levels have been set higher than the minimum level required due to tributary flooding.

3.5 Probable Maximum Flood Event

The PMF event was modelled and the flood extents are presented in Appendix B

Although flood panning levels are not set from the PMF event a review of the PMF extents has been conducted to ensure that safe evacuation routes are available. The proposed works do not prevent safe evacuation in a PMF event.

4. Conclusion

The previous flood modelling conducted as part of the original Oakdale Concept Plan has been updated to reflect the proposed s75W amendment to previous Project Approvals. The model update has been limited to the Ropes Creek tributary that traverses the Central Precinct.

The updated modelling considers both work under previous Project Applications that has been completed and proposed works as part of the s75W submission.

Flood extents for the 100-year event do not encroach on Lots 1C, 2B and 3A, and recommended minimum finished floor levels have been identified that incorporate appropriate freeboard to the 100-year flood levels associated with the tributary. The proposed pad levels for 1C, 2B, and 3A are above the minimum required finished floor levels.

The PMF event has been modelled and safe evacuation routes are available in such an event.

5. References

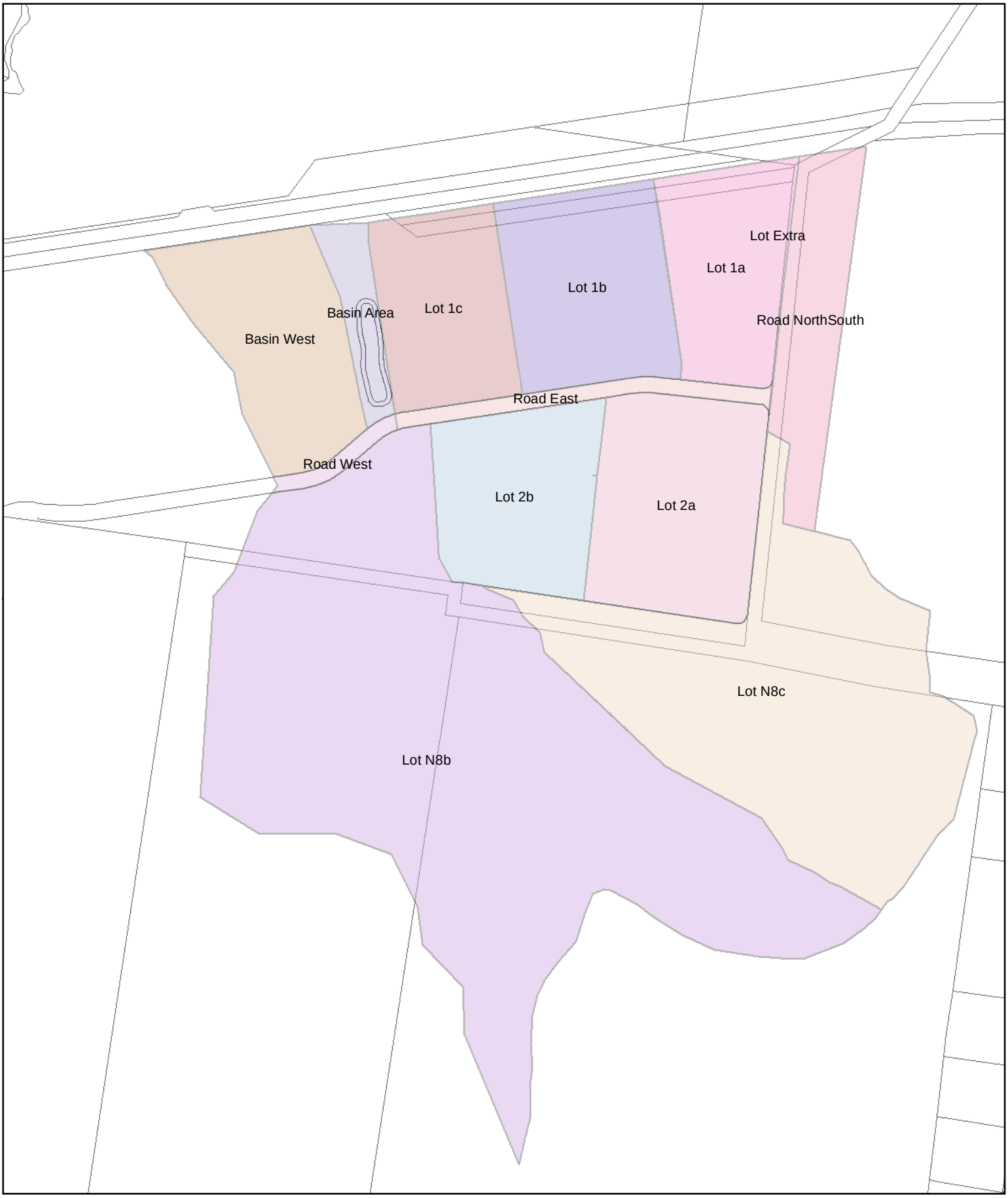
- GHD Pty Ltd (September 2010), “Oakdale Concept Plan, Water Sensitive Urban Design Strategy”
- AT&L Pty Ltd (June 2012), “Oakdale Central Stage 2 Estate Road Extension” Drawings.

Appendices

Appendix A

Hydrological Modeling Results

Catchment Plan



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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OAKDALE ROPES CREEK TRIBUTARY FLOOD STUDY

Catchment Plan

Job Number 21-21721
Revision A
Date 08 Aug 2012

133 Castlereagh St Sydney NSW 2000 Australia **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

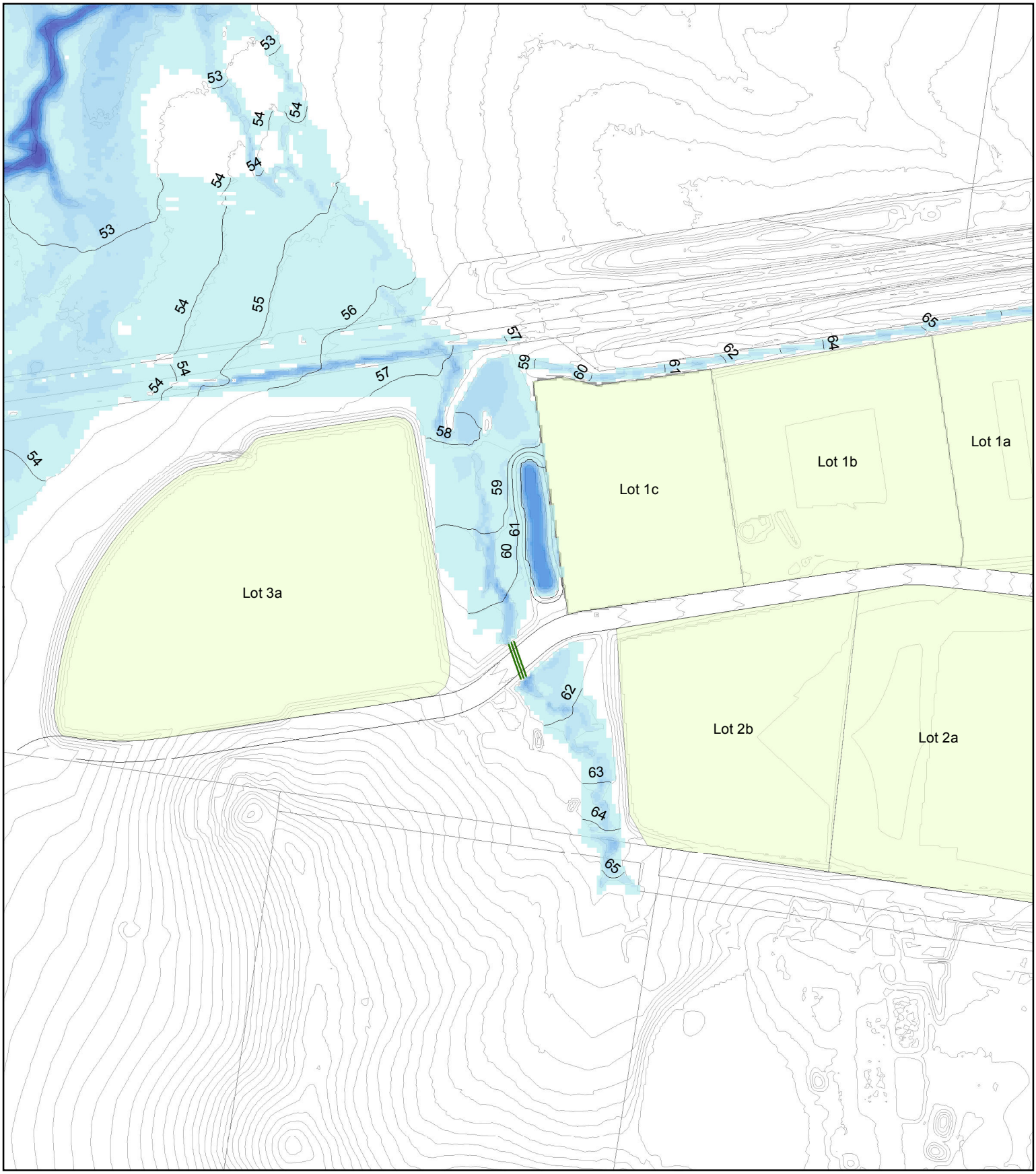
G:\21\21721\GIS\Maps\FINAL Map Publishing\Final CatchmentPlanA.mxd

Data source: Hard and Forester (Survey, 2012). AT&L Pty Ltd "Oakdale Central Stage 2 Estate Road Extension" Drawings (June 2012). Created by:jlam

Appendix B

Ropes Creek Tributary Flood Modeling Results

Flood extent mapping



Legend

- Design Basin
- Design Building Lot Pads
- Design Culvert
- Flood Level (mAHD)

Flood Depth (m)

0.00 - 0.25 | 0.25 - 0.50 | 0.50 - 0.75 | 0.75 - 1.00 | 1.00 - 1.25 | 1.25 - 1.50 | 1.50 - 1.75 | 1.75 - 2.00 | 2.00 - 2.25 | 2.25 - 2.50 | 2.50 - 2.75 | 2.75 - 3.00 | 3.00 - 3.25 | 3.25 - 3.50 | 3.50 - 3.75

Paper Size A4

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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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20-year ARI Event Flood Map

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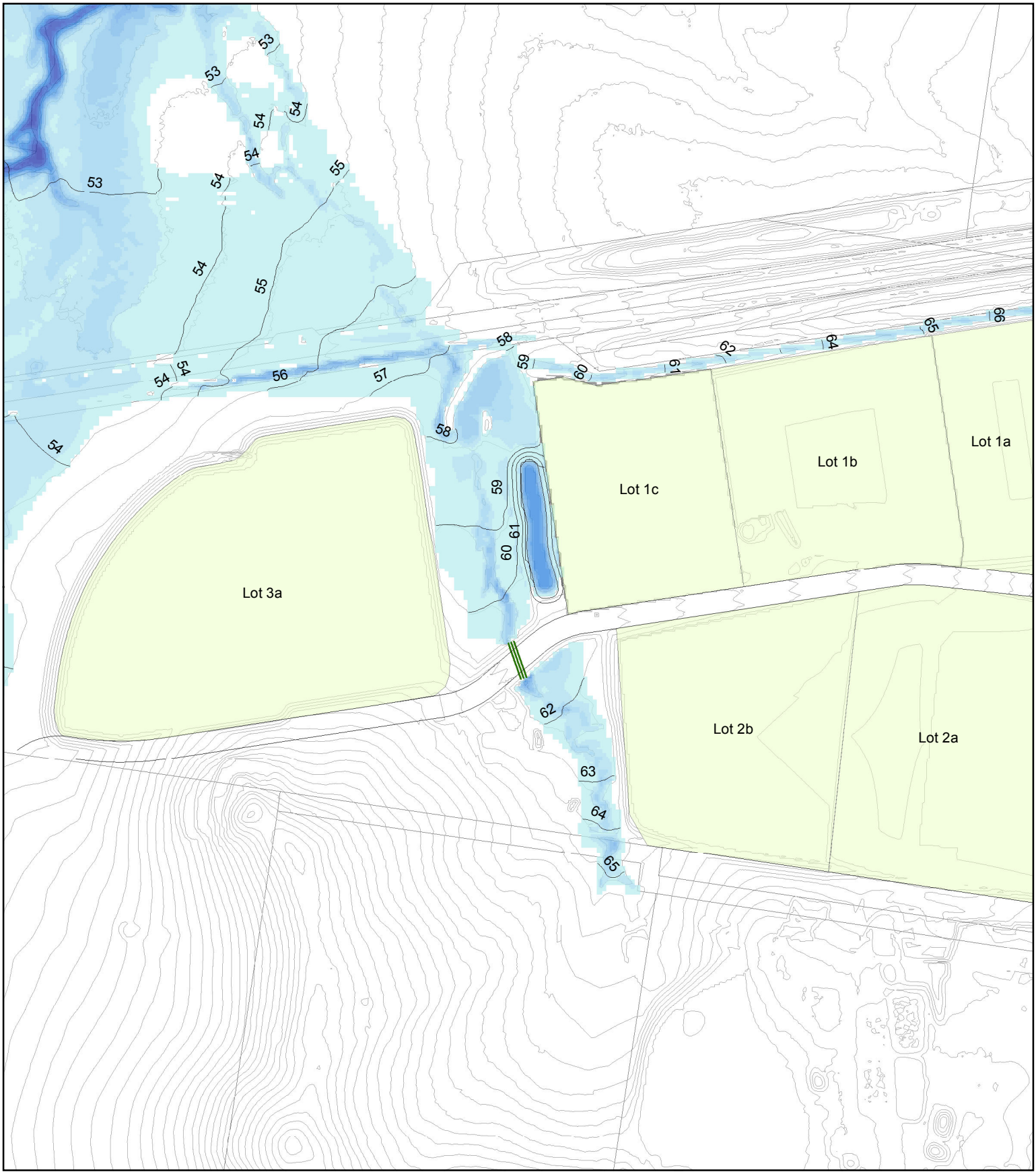
G:\21\21721\GIS\Maps\2012-10-11 FINAL Map Publishing\Final Run ARI_20.mxd

Data source: Hard and Forester (Survey, 2012). AT&L Pty Ltd "Oakdale Central Stage 2 Estate Road Extension" Drawings (June 2012). Created by:ncbailey



Legend

- Design Basin
- Design Building Lot Pads
- Design Culvert
- Flood Level (mAHD)

Flood Depth (m)

0.00 - 0.25 | 0.25 - 0.50 | 0.50 - 0.75 | 0.75 - 1.00 | 1.00 - 1.25 | 1.25 - 1.50 | 1.50 - 1.75 | 1.75 - 2.00 | 2.00 - 2.25 | 2.25 - 2.50 | 2.50 - 2.75 | 2.75 - 3.00 | 3.00 - 3.25 | 3.25 - 3.50 | 3.50 - 3.75 | 3.75 - 4.00

Paper Size A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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100-year ARI Event Flood Map

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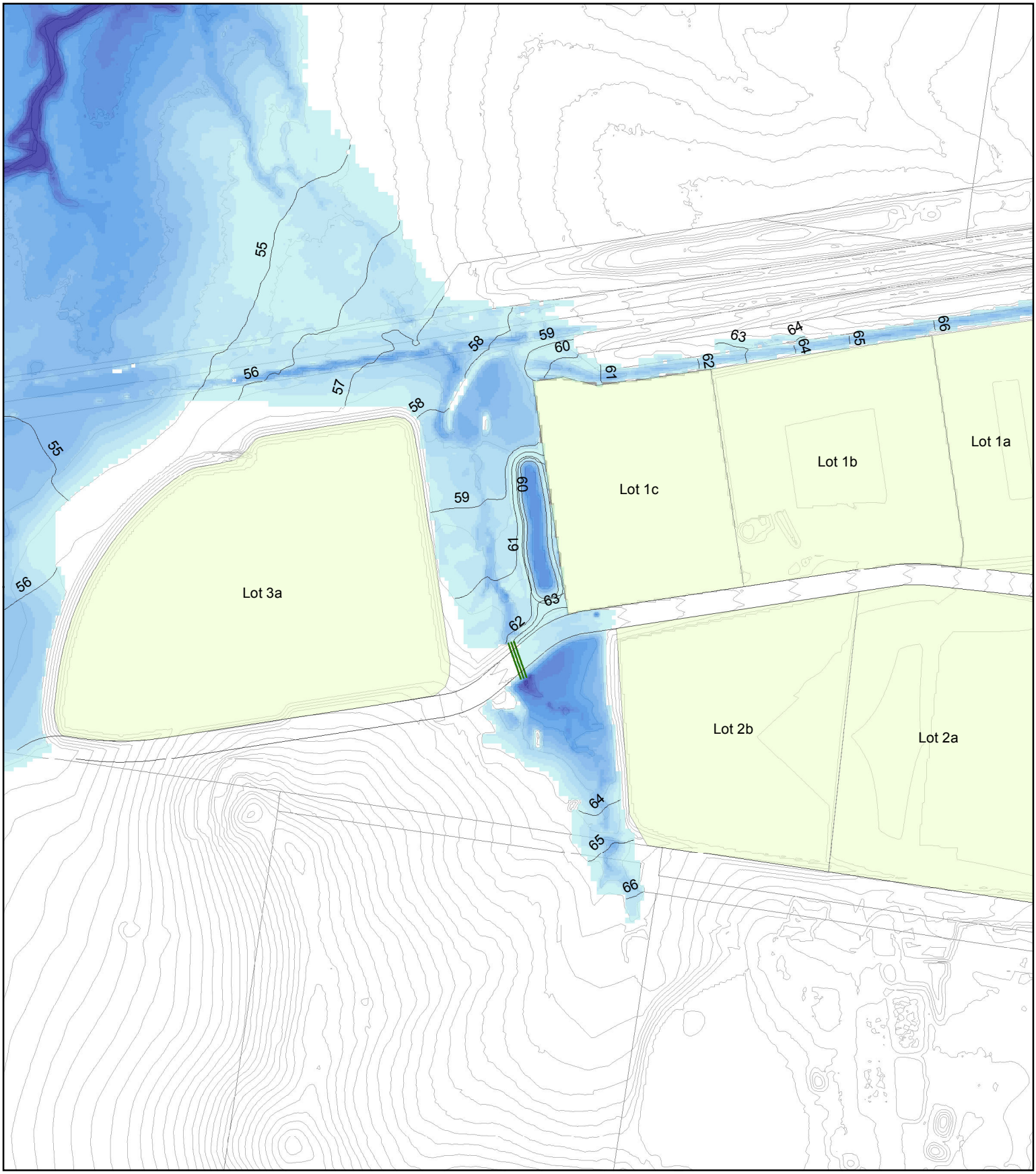
Data source: Hard and Forester (Survey, 2012). AT&L Pty Ltd "Oakdale Central Stage 2 Estate Road Extension" Drawings (June 2012). Created by:ncbailey



Legend

- Design Basin
- Design Building Lot Pads
- Design Culvert
- Flood Level (mAHD)

Flood Depth (m)

0.00 - 0.25 | 0.25 - 0.50 | 0.50 - 0.75 | 0.75 - 1.00 | 1.00 - 1.25 | 1.25 - 1.50 | 1.50 - 1.75 | 1.75 - 2.00 | 2.00 - 2.25 | 2.25 - 2.50 | 2.50 - 2.75 | 2.75 - 3.00 | 3.00 - 3.25 | 3.25 - 3.50 | 3.50 - 3.75 | 3.75 - 4.00

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PMF Event Flood Map

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Data source: Hard and Forester (Survey, 2012). AT&L Pty Ltd "Oakdale Central Stage 2 Estate Road Extension" Drawings (June 2012). Created by:ncbailey

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1	J. Lam	C. McDougall	*on file	C. McDougall	*on file	14/08/12
2	J. Lam	C. McDougall	*on file	C. McDougall	*on file	11/10/12

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