Project Name:	Hindu Temple - 230 – 242 Aldington Road, Kemps Creek
Project Number:	33696
Design Engineer:	IAH
Office:	Sydney
Date:	6/11/2017 1:53 PM
Design Section:	Upstream Catchment Flow Conveyance

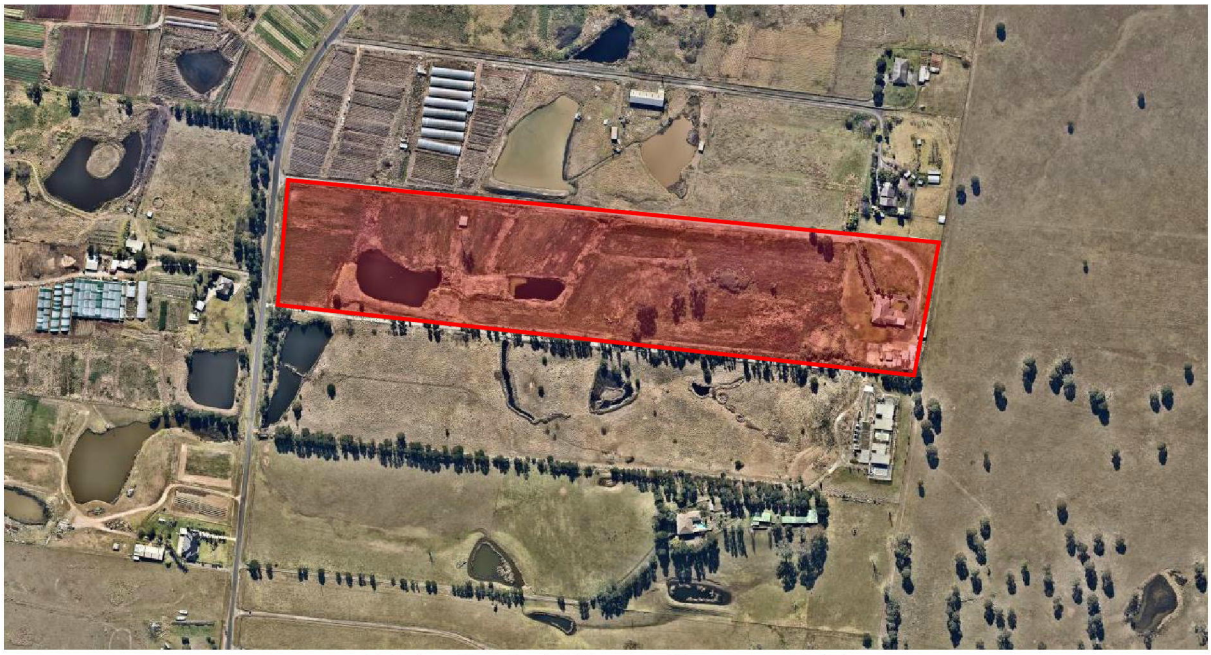
Upstream Catchment Flow Conveyance

Introduction

This report has been prepared to summarise the investigation and design of the drainage infrastructure required to convey the stormwater flows from the upstream catchments through the proposed development site at 230 – 242 Aldington Road, Kemps Creek. It is proposed that the site will be developed and a new Hindu Temple.

Existing Site

Address: 230 – 242 Aldington Road, Kemps Creek, Lot 18, DP253503
Site Area: 101,510m²
Current Land Use: Rural farm land



Existing Site Aerial (Source: Nearmaps 2017)

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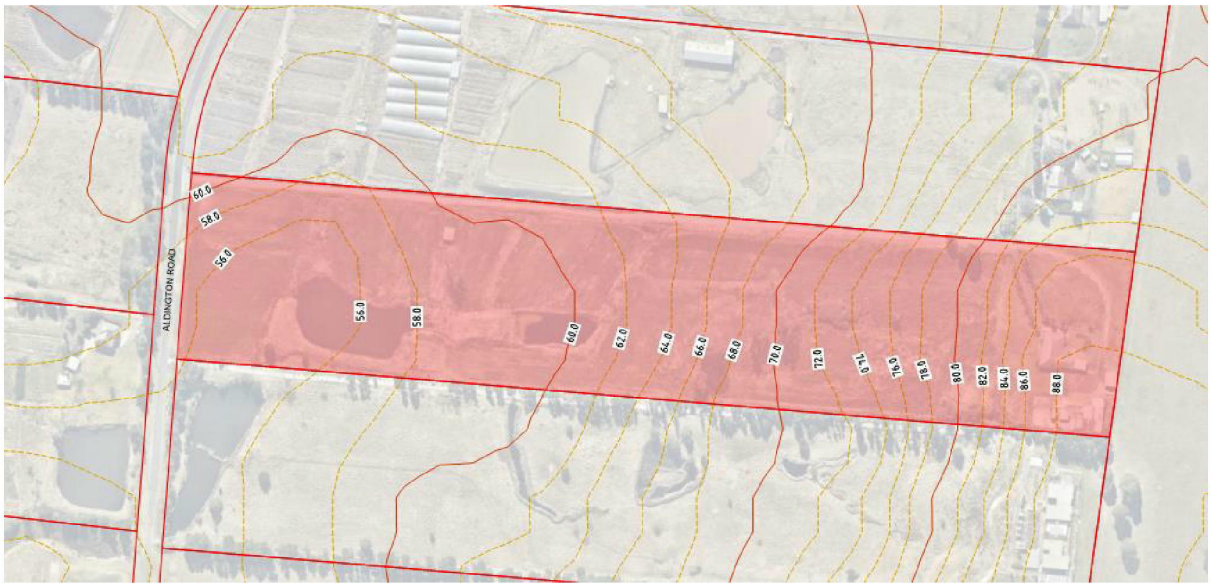
Topography:

A 3D model using Lidar data has been set up for the site and surrounding land. This model has been used to assess the existing topography of the site and also the upstream stormwater catchments impacting on the site.



Existing Site Topography (Source : WGE Model)

The terrain modelling shows that the site generally falls from east to west with levels dropping from RL88.00m AHD at the south eastern corner of the site to RL56.00m AHD at the south western corner of the site.

Existing Stormwater Conveyance:

The site currently has two dams located on the property which are used to store water for irrigation purposes. Drainage ditches have been constructed on the site to collect rainfall runoff from the site and convey it to these dams. Overflow from the dams are conveyed to the low point of the site through drainage ditches.

Stormwater discharge from the site is conveyed under the adjacent properties access road into a dam within that property.

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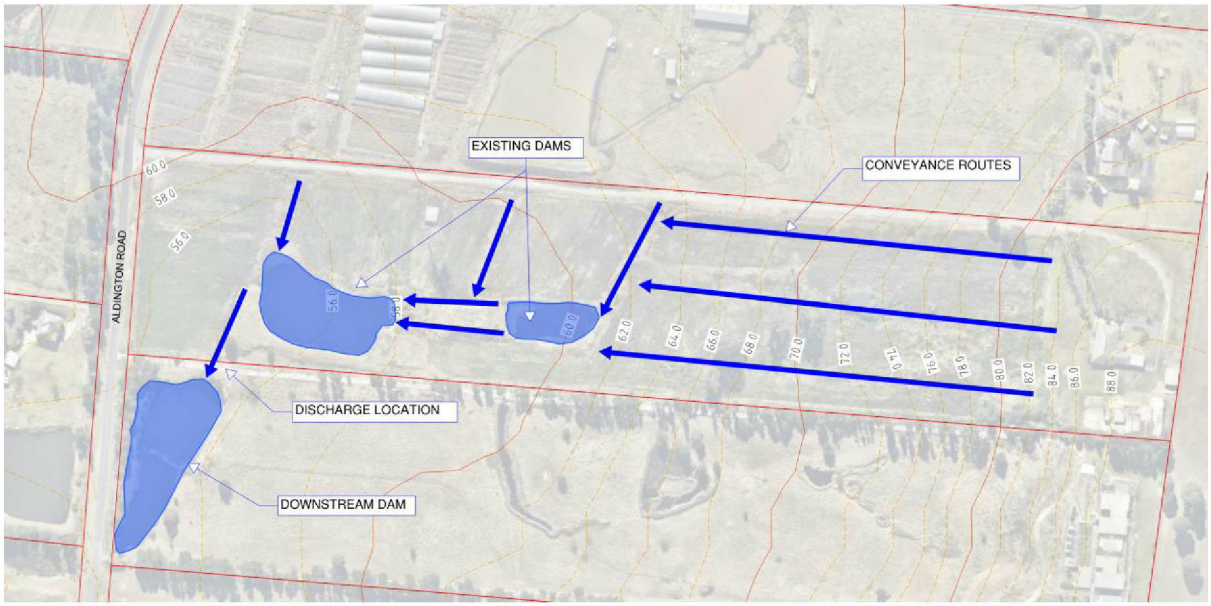
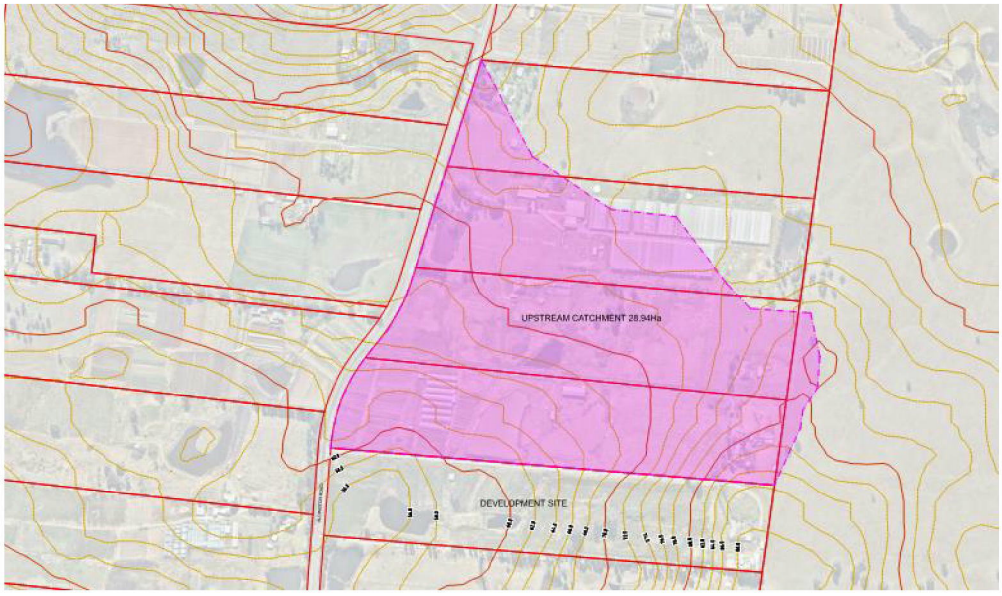


Existing Site Stormwater Conveyance Routes

Upstream Catchment Analysis:

Using the WGE created 3D model and assessment of the upstream catchment impacting on the development has been undertaken. It is important to note that the property upstream of the development site also has a storage dam and discharge from this dam will only impact the site in the event that the dam overflows.

Assuming that the upstream dams are completely full at the time of the storm event the upstream catchment impacting on the proposed development site will be 28.94Ha. This catchment is 90% impermeable currently.



Upstream Catchment Analysis

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Existing Site Discharge Flows:

The stormwater conveyance across the site has been modelled using DRAINS hydraulic modelling software. The catchment has been assessed as 90% impermeable at this time.

Input Information:

Model Type: ILSAX
Rainfall Info: From BOM IFD data
Catchment Properties: Area = 28.94Ha
% Impermeable = 90%
Catchment average gradient = 3.4%
Catchment maximum length = 650m

Rainfall Intensity Information:

Intensity-Frequency-Duration Table

Location: 33.850S 150.800E NEAR.. Kemps Creek Issued: 11/8/2017

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

	Average Recurrence Interval						
Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	76.8	99.0	128	144	166	195	217
6Mins	71.8	92.6	120	135	156	183	204
10Mins	58.7	75.7	97.6	110	127	149	166
20Mins	42.8	55.2	70.9	80.1	92.2	108	120
30Mins	34.8	44.8	57.5	64.9	74.7	87.5	97.2
1Hr	23.5	30.3	38.9	43.9	50.5	59.2	65.7
2Hrs	15.5	19.9	25.5	28.8	33.1	38.8	43.1
3Hrs	12.0	15.4	19.8	22.3	25.7	30.1	33.4
6Hrs	7.75	10.0	12.8	14.4	16.6	19.4	21.6
12Hrs	5.00	6.45	8.31	9.38	10.8	12.7	14.1
24Hrs	3.20	4.14	5.41	6.17	7.14	8.43	9.43
48Hrs	1.98	2.59	3.45	3.99	4.66	5.56	6.27
72Hrs	1.45	1.91	2.58	2.99	3.52	4.23	4.78

(Raw data: 30.41, 6.46, 1.91, 59.07, 12.6, 4.22, skew=0.01, F2=4.3, F50=15.8)

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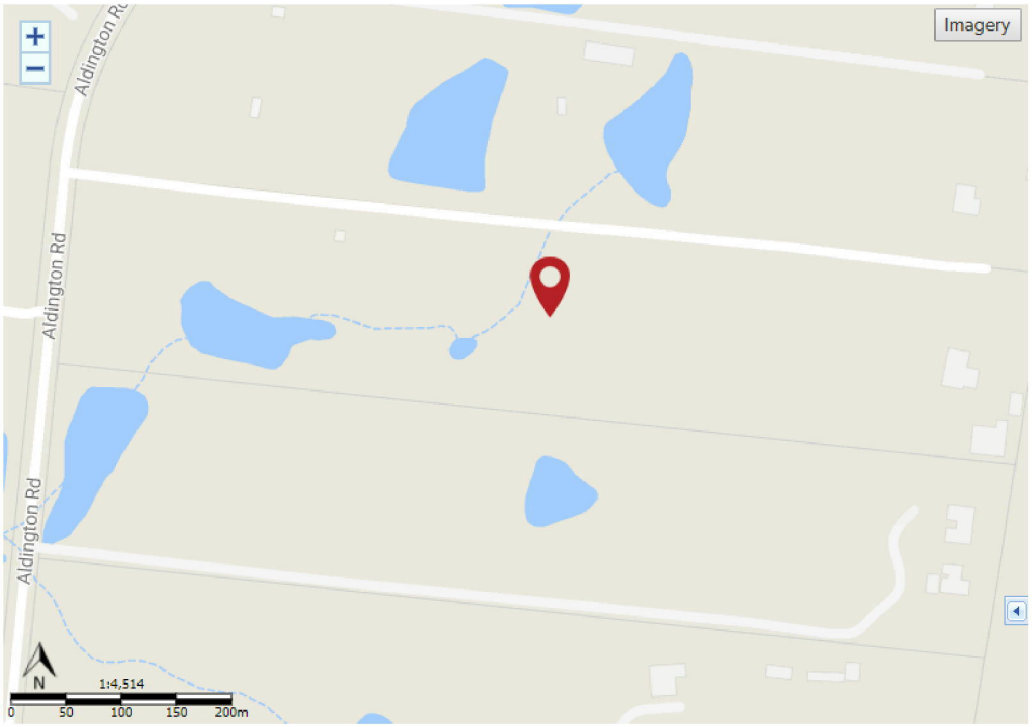
The following summary table shows the discharge flows impacting on the development during a range of design storms.

Design Rainfall Event (Years)	Peak Discharge onto site (cumecs)
5	2.38
20	4.12
50	5.19
100	6.28

Peak Discharge Flows from Upstream Catchment (Source: DRAINS)

Councils planning viewer indicates that there is a creek line which passes from the upstream property through the centre of the development site as shown in the extract below.



Council's Planning Viewer Extract

Wood & Grieve have assessed the existing land form of the upstream development and have identified that land formation has been undertaken on that site to direct the water flowing from the higher dam down to the lower dam.

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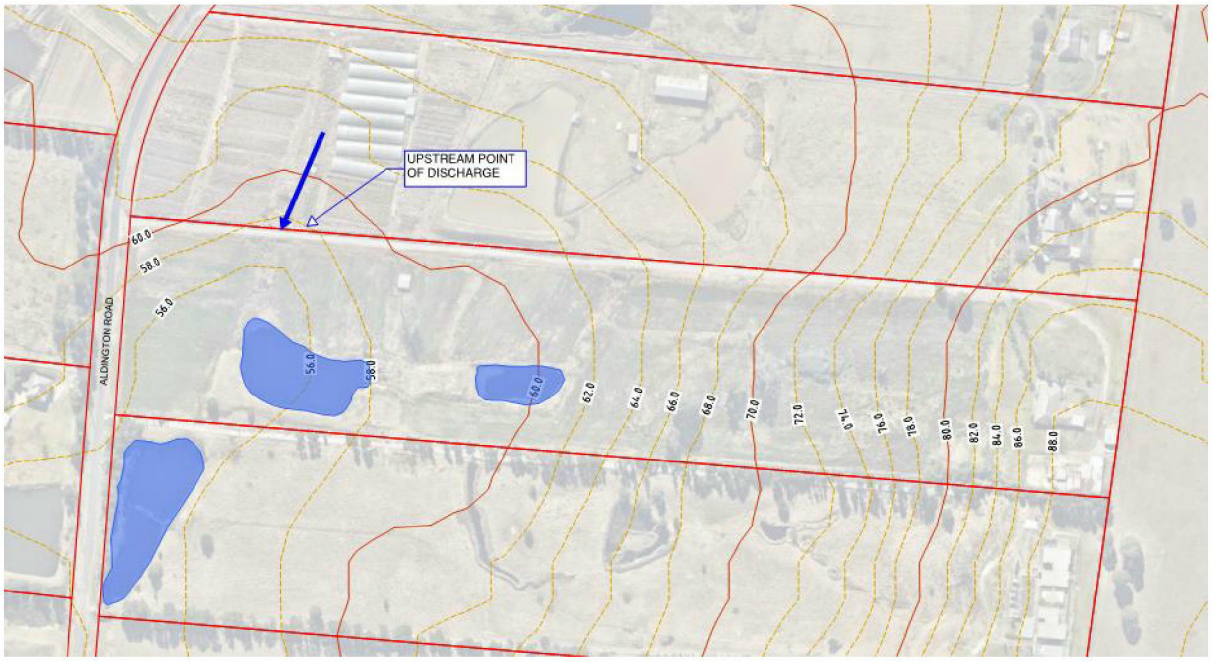
This means that the route for water migration across the upstream site differs from the planning map. The point of discharge will be further west at the low point on the site and discharge will only occur in the event that the upstream dams are full during a stormwater event.

From assessment of the existing topographical contours for the upstream catchment it has been identified that the upstream catchment runoff will discharge onto the site at a single location as indicated on the image below.



Existing Upstream Point of Discharge

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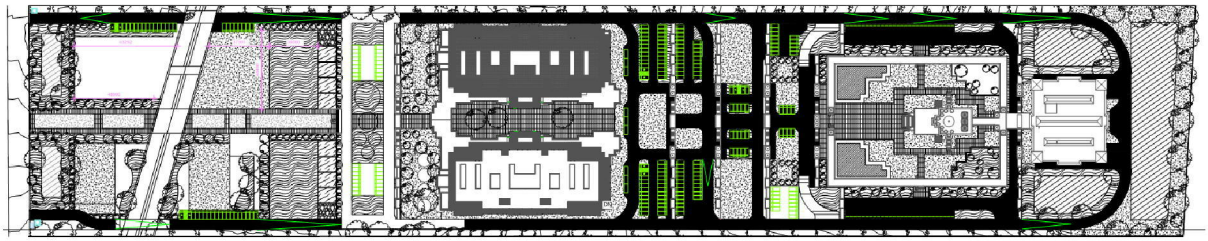
Proposed Development

It is proposed that a new Hindu temple will be constructed on the site along with associated access roads, car parking and landscaping. The image below shows the current proposal.



Proposed Development Layout

As can be seen on the proposed layout there will be a 9.12m wide service road running along the northern and southern boundary. These roads will effectively block the existing discharge route from the upstream catchment onto the site and the discharge route from the site onto the downstream property. To prevent impacting the conveyance of stormwater flows through the development it is proposed to construct stormwater culverts under both of these roads.

Culvert Options:

There are two options for the installation of the culverts as noted below:

1. Size the culverts to convey the 20 year design flow, 4.12cumecs with any flows in excess of this overtopping the service roads and discharging as overland flow. This option will reduce the culvert size required but will cause the road to flood in storm events greater than the 20 year.
2. Size the culverts to convey the 100 year flows, 6.28cumecs. This option will mean larger culverts but will prevent stormwater flow over the access roads.

The developer should consider whether the impact of overland flow occurring during large rainfall events is considered acceptable or whether their preference is to keep all conveyance contained within the culverts for all storm events.

Culvert Sizing:

Using the DRAINS modelling software and assessment has been undertaken to calculate the required culverts sizes to convey the design flows for both options.

The following assumptions have been made in this analysis:

- The upstream catchment discharge is maintained if development occurs i.e. OSD will be incorporated on any development upstream;
- OSD will be provided on the development site to maintain the discharge flows from the site to the downstream site.

The results of this analysis are identified below:

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Drainage Option	Northern Culvert Size	Southern Culvert Size	Overland Flow over Road
1 – 20 Year	2No 1200 x 900 RCBC	2No 1200 x 900 RCBC	0.726cumecs
2 – 100 Year	3No 1400 x 900 RCBC	3No 1400 x 900 RCBC	N/A

Culvert Sizing Requirements (Source: DRAINS Model)

The depth of flow across the road would be dependent on the geometric design of the road which has not be confirmed at this time.

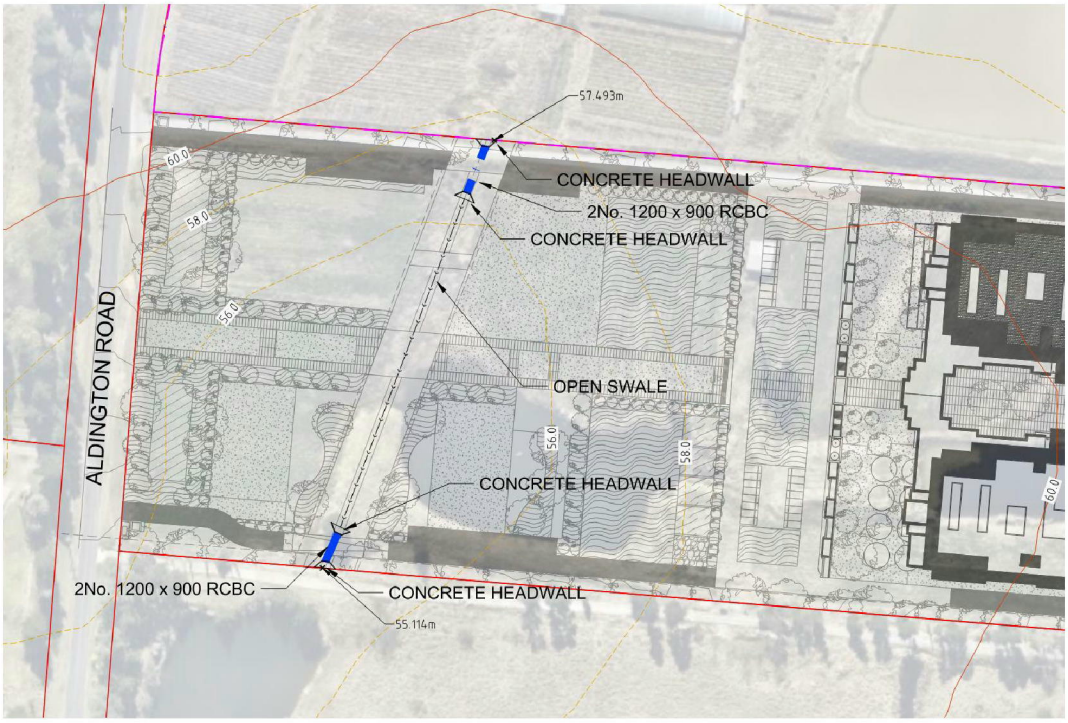
Overland Conveyance

The conveyance of upstream flows across the site will be via a reconstructed creek. The creek will connect the existing upstream discharge point to the existing downstream discharge point. The creek will be vegetated and landscaped to maintain existing overland flows which eliminating the risk of erosion and sedimentation pollution downstream of the site.

Initial calculations suggest a creek bed of 19m wide would result in a 0.2m deep flow during a 100 year design event with water travelling at 1.63m/s.

Proposed Arrangements:

The image below indicates the proposed arrangement for the flow conveyance across the site.



Proposed Conveyance Arrangement

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Conclusion

WGE have assessed he impacts of the existing upstream catchment on the development site and have calculated the discharge flows from onto and also from the site.

In order to maintain the existing conveyance of flows across the site it is proposed that in ground culverts will be constructed below the new roads to convey flows under these roads. The flows will then be conveyed across the site via a naturalised creek.