6.2.19 Ulan Road Upgrade – Investigation & Design Contract – Variations to Contract

REPORT BY THE SENIOR WORKS ENGINEER TO 18 MARCH 2015 COUNCIL MEETING
Ulan Road Variation Report
GOV400043, COR400061

RECOMMENDATION

That:

1. **the report by the Senior Works Engineer on the Ulan Road Upgrade – Investigation & Design Contract – Variations to Contract be received;**

2. **Council accepts GHD Pty Ltd (GHD) October 2014 – February 2015 Variations to Contract 2014/01 for the Investigation and Design of the Ulan Road Upgrade to the value of $27,215.00 excl. GST; and**

3. **Council delegate authority to the General Manager to approve any additional variations up to a further 5% of the amended contract value of $384,460 excl. GST.**

Executive summary

On 23 June 2014 GHD Pty Ltd was awarded the contract for the Investigation and Design of the Ulan Road Upgrade to the value of $333,200 (excl. GST).

Part of this design work included a drainage study for the low section of Ulan Road south of Cooyal Creek to determine the height by which the road could be raised, and the exiting culverts up-sized to minimise flooding of Ulan Road during periods of high rainfall.

On completion of the drainage analysis, GHD concluded that the existing box culverts at the low point could be retained. If the road was to be raised by 400mm, flood immunity for the road would be provided for the ten year storm event although the risk of upstream flooding was unable to be quantified under this study. This report recommends a further investigation at a cost of $27,215.00 excluding GST to investigate upstream flooding if the road was to be raised.

Detailed report

GHD proposes that we consider a further drainage study of Cooyal Creek to determine the risk associated with raising the road and to establish the resultant flood immunity for surrounding properties.

Further boundary redefinition work is needed to provide more certainty around the extent of encroachment into certain properties beside Ulan Road. The Lawry property at 1262 Ulan Road and the Huntington Estate opposite Buckaroo Lane are two of these properties.

In line with standard contracting procedures, the designer has submitted Variation Orders to carry out the additional work over and above the original contract. The cumulative amount of these variations exceeds 5% of the contract sum which is outside the delegated authority of the General Manager to approve. This report requests the approval of those variations via Council resolution.

The table below sets out those departures from the original scope of work that have been uncovered during the design process.

VO No.	Date of VO	Description	Submitted Price (excl. GST)	Approved (excl. GST)
VO1	23/07/14	George Campbell Drive realignment	$ 2,925	$ 2,925
VO2	20/08/14	1. Additional Mid Block survey of 14.500 to 14.912 covering the gap between two mid-block sections. 2. Additional survey of centreline of Ulan Road from 35.100 to 37.407	$ 11,505	$ 11,505
Previously approved by GM				**$ 14,430**
VO3	1/09/14	Buckaroo Lane peg out for MWRC review of any property encroachment	$ 1,350	$ 1,350
VO4	4/09/14	Wollar Road redesign for property owner concerns	$ 6,650	$ 6,650
VO5	8/09/14	MacDessi boundary redefinition survey to check whether there is any encroachment into property	$ 1,615	$ 1,615
Amount previously Approved by Council				**$9,615**
VO6	16/10/14	Lawry boundary redefinition survey to determine the extent of any encroachment into property	$ 2,635	$ 2,635
VO7	16/12/14	Huntington Estate boundary redefinition survey to discuss with owners regarding the extent of encroachment into the property	$ 3,940	$ 3,940
VO8	12/02/15	Additional Cooyal Creek drainage study	$ 20,640	$ 20,640
Amount to be Approved by Council to date				**$27,215**

VO1 and VO2 were previously approved by the General Manager under delegated authority, while VO3 - VO5 have previously been authorised by Council.

The Variation Orders VO6 – VO8 described below require authorisation from Council.

LAWRY BOUNDARY REDEFINITION

VO6 came about as a result earlier MWRC construction work on Ulan Road, during which Council undertook to redefine Mr Lawry's road frontage boundary. This Variation Order was prepared for this purpose.

HUNTINGTON ESTATE BOUNDARY REDEFINITION

VO7 arose as a result of consultation with the owners of the Huntington Estate Winery, which saw them raise concerns regarding possible encroachment issues associated with the Buckaroo Lane intersection upgrade. This revealed the need to show on the ground the extent of the proposed construction work.

Although the extent of work was pegged out, it was still very difficult to see where the property boundary actually lay and the decision was made to redefine the road frontage boundary at 20m intervals to show the impact on the winery entrance. The design will be discussed again with the owners, this time with a better understanding of where the boundary lies in relation to the new roadworks.

COOYAL CREEK FLOOD STUDY

VO8 is required as a result of the need to establish the flood characteristics of Cooyal Creek to allow an informed decision on the risk of raising the road and up-sizing the culverts.

Historically, Ulan Road in the location of the Cooyal Creek Bridge has overtopped on numerous occasions, during which the creek has backed up causing widespread upstream flooding, which has impacted the adjacent properties.

On completion of the drainage analysis GHD determined that the existing four cell 1200x600 box culverts at the low point are adequate. While raising the road by 400mm would provide flood immunity for the road under the ten year storm event GHD were unable to quantify the risk of upstream flooding under this study.

GHD also noted that "*There is widespread flooding in the 100 year event so it is not practical to provide immunity; however, our model does not consider floodplain storage and is based on the rational method only... (and) ...we are not able to understand potential upstream impacts of flood afflux."*

GHD has proposed that a further drainage study be carried out to gain a better understanding of the risk of raising the road and increasing the size of the culverts. GHD has provided four options as outlined in the attached memorandum and have recommended Option 2 as the best value for money.

Financial and Operational Plan implications

INTERSECTIONS

There are twenty-six road intersections requiring an upgrade to Austroads standard, ten of which are major intersections requiring more than BAR/BAL configuration. It is possible that detailed design may show encroachments into adjoining properties. Minor redesign may arise from any meetings with property owners at an associated cost.

OVERTAKING LANES

The extent of the encroachment of the overtaking lanes remains unknown at this stage. The overtaking lanes on Cooks Gap Hill and Frog Rock Hill will require some deep filling in places and the toe of the 1 in 4 batter from the pavement hinge point may encroach onto the neighbouring properties. Minor redesign may result from consultation with property owners at an associated cost.

Sufficient contingency has been built into the total budget of $18,685,257 excl. GST to be funded by Restart NSW and the three mines and with only a further two months of design work remaining it is fully expected that the contingency will not be wholly expended. Whilst no further material variations are anticipated, it would be prudent to grant a delegation to the General Manager to approve additional variations to maximum of 5% of the amended contract value ($384,460 excluding GST ie $19,223 excl. GST). This would avoid the need to prepare additional reports to Council for immaterial variations should they arise.

Community Plan implications

Not applicable.

PAUL CRAWFORD
SENIOR WORKS ENGINEER

DARYL COLWELL
DIRECTOR, OPERATIONS

9 March 2015

Attachments: 1. GHD Variation Order No.VO8

APPROVED FOR SUBMISSION:

BRAD CAM
GENERAL MANAGER

ATTACHMENT 1

Change Management and Variation Form

GHD Project Number:	22/17392	**Change / Variation No.**	V08
Client:	Mid-Western Regional Council		
Project:	Ulan Road upgrade		
Brief Description:	Cooyal Creek flood study		
Predicted Duration:			4 weeks
Predicted Project Delay:			4 weeks
Budget / Cost implications (excluding GST): NB cost can be Nil			$ 20,640 (recommended. See below)

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Change / Variation Description:

Cooyal Creek flood study

The options below are for the the study to establish flood characteristics of the Cooyal Creek flooding. This will allow an informed decision on the interaction of road raising and culvert provision to alleviate flooding over Ulan Road and to understand potential impact to adjacent properties.

Our proposal, as agreed at the pre-tender meeting, allowed for the assessment of the catchment using the rational method and sizing culverts based on those flows. Upon completing these calculations, there were significant uncertainty around the resultant flood levels and culverts sizes required to provide certainty in the flood immunity achieved.

Option 1: Basic

The steps in the methodology would include:

- Establishment of a discharge relationship for the flow crossing Ulan Road (sum of weir flow formula for the overtopping of Ulan Road, culvert flow formula for culvert flow under Ulan Road plus a head loss flow relationship for the bridge over Cooyal Creek
- Establishment of a RAFTS estimate of a range of peak flood flow rates at Ulan Road for the upstream catchment for events for 2, 5, 10, 20, 50 and 100 year ARI critical duration magnitude
- Based upon a walk over assessment of the creek bank estimate the Cooyal Creek flood level that would cause flow to break onto the flow path for the culvert
- Assess the flood levels upstream of Ulan Road together with overtopping levels from the above predictive relationship
- Document the adopted methodology and results of the analysis

Survey: No additional survey is required

Fee: $13,450 ex GST

Limitations: This approach would most probably underestimate flood levels at Ulan Road as it would ignore the presence of any backwater effects from downstream of Ulan Road. The magnitude of the underestimate is unknown. For this reason we don't believe this option presents value for money ✓

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Option 2: Recommended

The steps in the methodology would include:

- Undertake field survey of the sections shown on attached figure
- Undertake a site visit
- Establishment of a RAFTS estimate of a range of peak flood flow rates at Ulan Road for the upstream catchment for events for 2, 5, 10, 20, 50 and 100 year ARI critical duration magnitude. This would be the same as for Option 1
- Use the surveyed sections to establish a HEC-RAS (1-dimensional) model of the surveyed sections
- Operate the HEC-RAS in an iterative mode to establish the flow split between Cooyal Creek and flow on the floodplain south of Cooyal Creek. That split will also provide the definition of flood levels over Ulan Road for the range of design flow rates
- Document the adopted methodology and results of the analysis

Survey: Additional cross sections along Cooyal Creek would be required

Fee: $20,640 ex GST

Limitations: This approach would be expected to provide predicted levels over Ulan Road to be +/- 150 mm. Given the location and population density we recommend this option as presenting best value for money.

Option 3: Improved accuracy

The steps in the methodology would include:

- Establishment of a RAFTS estimate of a range of peak flood flow rates at Ulan Road for the upstream catchment for events for 2, 5, 10, 20, 50 and 100 year ARI critical duration magnitude
- Undertake a site inspection
- Undertake field/air survey of the area shown hatched in the attached image. The air survey being sufficiently accurate to establish a DTM having a vertical resolution of 0.25 m and a vertical accuracy of +/- 0.1 m.
- Use the DTM data to establish a TUFLOW (2-dimensional) model of the hatched area
- Operate the TUFLOW model for each ARI event to establish flood conditions over Ulan Road
- Document the adopted methodology and results of the analysis

Survey: Air survey (using a drone) for area shown plus ground establishment

Fee: $38,900 ex GST

Limitations: This approach would have minimal benefit over the results from Option 2. It would allow the TUFLOW model to establish its own flow path / overflow level from the creek rather than rely upon a user forced overflow location. The magnitude of the improvement in estimates from Option 2 is likely to be minimal

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Option 4: Detail catchment modelling (Not recommended)

The steps in the methodology would include:

- Undertake a site inspection
- Establishment of a course TUFLOW model over the entire catchment area
- Operate the course TUFLOW model to establish the critical duration flood duration for the 2, 5, 10, 20, 50 and 100 year rainfall events. It is likely that the TUFLOW analysis will give reduced design flow rates to the RAFTS model due to an improved representation of the catchment storage
- Undertake field/air survey of the area shown hatched in the attached image. The air survey being sufficiently accurate to establish a DTM having a vertical resolution of 0.25 m and a vertical accuracy of +/- 0.1 m.
- Use the DTM data to establish a TUFLOW model of the hatched area
- Operate the finer scale TUFLOW model for the hatched area and operate it for each ARI event to establish flood conditions over Ulan Road
- Document the adopted methodology and results of the analysis

Survey: Air survey of ***entire*** upstream catchment (apparently around 75 km^2) plus ground establishment for hatched area

Fee: ~$100k ex GST, pending confirmation of survey costs

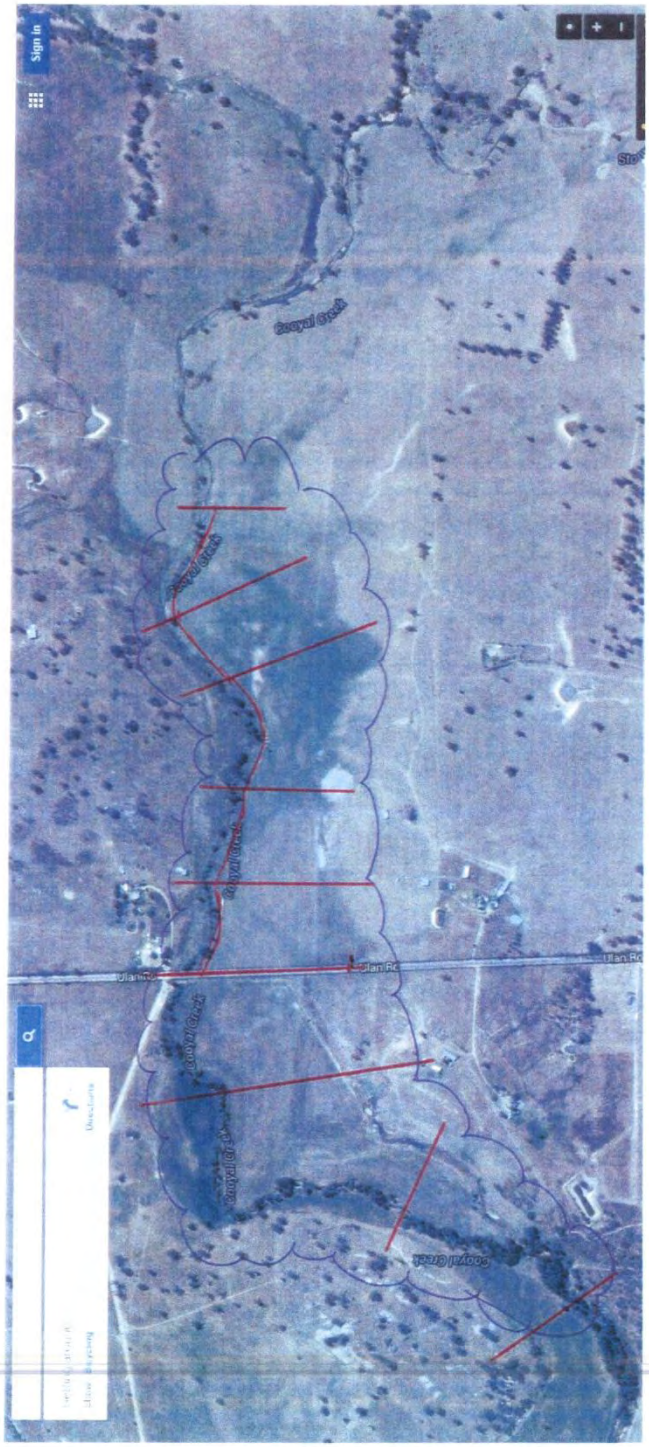
Limitiations: This approach would be expected to provide the most realistic representation of the flow rates and required upgrade works. However the expense is probably not warranted for the locality. ✓

Clients Comments

Signed:	P Youman	Signed:	16/2/15
Name:	Paul Youman	Name:	Paul Crawford
Position	Project Manager	Position	Project Manager
Company:	GHD	Company:	Mid-western Regional Council
Date:	11/02/2015	Date:	16/2/15

OK to proceed

16.2.15


Sign In
Royal Creek
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Survey sections in red.
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