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Wood Proposal # CWP21PROPGOVT
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Drumheller Resiliency & Flood Management Office
Mark Steffler, Interim Flood Project Director
Town of Drumheller
702 Premier Way
Drumheller, AB T0J 0Y0

Dear Mark,

Re: Proposal for Additional Scope Items Related to Lehigh Comprehensive Flood Mitigation Analysis Report

1.0 Introduction

As requested by the Drumheller Resiliency & Flood Management Office (DRFMO), Wood Environment & Infrastructure Solutions (Wood) is pleased to provide this proposal for additional scope items related to the Lehigh Comprehensive Flood Mitigation Analysis Report.

The DRFMO requires a comprehensive flood mitigation analysis report for the community of Lehigh that includes an assessment of Red Deer River surface water and groundwater flooding risks and potential mitigation works. Lehigh is located in the Red Deer River floodway/flood fringe and is not protected by dikes. Wood completed a conceptual level design report of flood mitigation works which included hydrogeologic (groundwater) and geotechnical investigations and analyses that were based in-part on limited borehole data. The hydrogeologic analyses to-date show that sub-surface flooding would occur behind a dike. However, the extent of groundwater related flooding may be underestimated based on anecdotal evidence of previous floods and the pervious nature of the sub-surface materials (i.e., gravels and sands). Further hydrogeologic and geotechnical investigations and analyses that are detailed in this proposal would help to better define the extent of groundwater related flooding.

In addition, the comprehensive report would contain an assessment of potential flood mitigation measures such as channel widening and dredging. Northwest Hydraulic Consultants (NHC) recently completed the Drumheller flood hazard studies and would undertake the surface water component of the comprehensive study.

The comprehensive report would include both the above noted Wood (hydrogeologic) and NHC (surface water) components. The report would be under Wood letterhead or possibly letterheads for both Wood and NHC. The proposed Table of Contents for the comprehensive report is contained in **Appendix A** of this proposal.

2.0 Wood Additional Scope of Work Items

The Wood additional scope of work items are detailed below. The ground truthing surveys would be undertaken by Hunter Surveys directly for DRFMO under their existing agreement/contracts. Hence, these services are described below but the costs are not included directly in the Wood estimate. Similarly, the costs associated with the NHC component are not included in this proposal and it is assumed they would submit their proposal directly to DRFMO.

The majority of the comprehensive report (as outlined in the Table of Contents contained in **Appendix A** of this proposal) is included in Wood's existing scope and only the additional items are detailed below.

2.1 Ground Truthing Surveys

Hunter Surveys had completed ground truthing survey at some of the other communities to confirm elevations of ground floors and cross check LiDAR data etc. Lehigh has approximately 20 so properties where we would gather/confirm elevation information.

Most of the Lehigh residences are manufactured homes that do not have basements. The above noted information would be useful to confirm the depth of flooding at each property. We contacted Bill Hunter and his cost estimate for this survey was [REDACTED].

2.2 Additional Hydrogeologic Investigation

The additional hydrogeologic services are listed below:

Review of Additional Data: Review of additional data, including existing drilling and aquifer test data, detailed topography, surface geology, and other site-specific information. A check of water well records in the area indicate that there are two that have pump test data that should be useful. Additional pump testing may not be required if this information is adequate.

Field Visit/Reconnaissance: A one day field reconnaissance/visit to ground-truth areas of low topography, high permeability surface materials, potential areas of daylighting of flood-induced groundwater seepage, and potentially impacted surface and subsurface structures. Additional hydraulic testing/measurements including slug tests in existing standpipes and/or set-up of longer-term water level monitoring using transducer-dataloggers may be attempted if practical. Also monitoring of any new drilling or test-pitting, if undertaken. As noted above, it is expected that pumping tests will not be required, as some historical data is already available. If data is not suitable then we can discuss with the DRFMO the potential benefits and associated costs of conducting pump tests.

Analysis of Field Data: This includes pumping test/slug test/ or water level, etc., to refine estimates of hydraulic parameters for input to seepage calculations and SEEP/W model.

Revise Calculations: This includes updating the previous /SEEP/W analysis and figures.

Reporting: The above noted investigation, analysis and findings will be used to update and revise the existing Lehigh hydrogeologic report.

2.3 Co-ordination and Compilation of Additional Information

As previously noted, the majority of the comprehensive report is included in Wood's existing scope. Some nominal hours are included for coordination with NHC and Hunter Surveys and compilation of the additional information into the report. Some additional hours are also included for project management.

2.4 Additional Geotechnical Investigation (Optional)

Shallow test pitting at multiple locations was previously discussed with DRFMO as a potential way to determine the near ground soil composition. This would involve one or two days for a backhoe to excavate the test pits. The soil composition would be logged by a Wood geotechnical engineer/technician and soil samples would be collected for materials testing. The original ground elevations at the test pits would have to be restored. Select locations that have equipment access would need to be identified. Ideally, the test pits would be located on Town-owned land so that landowner permission is not required. The requirement for this investigation can be reassessed once the results of the hydrogeologic investigation are reviewed as this may indicate that further geotechnical investigations are not required. The costs for this optional investigation are not included in our cost estimate.

3.0 Cost Estimate and Schedule

The estimated manhours and costs for this additional scope are contained in **Table 1**. We estimate the draft report will be delivered to DRFMO within two to three months of obtaining the approval to proceed.

4.0 Closure

Please contact the undersigned if there are any questions regarding our proposal.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Prepared by:



L.S. Hundal, M.Eng., P.Eng.
Senior Associate Water Resources

Reviewed by:



Josh Strukoff, P.Eng.
Senior Water Resources Engineer

Table Drumheller Resiliency and Flood Mitigation 204 - Lehigh Comprehensive Report

Resource	Project Manager Liv Hundal	Engineering Lead/Assistant PM Josh Strukoff	Hydrogeologist Dave Parsons	Project Engineer Scott Wagner	Technical Support CAD	Reviewer Lloyd Madge/Sukru Sumer	Administrative Support Not-Named	Total Hours	Total Fees	% of Fees (for Disb'ts 6% Office)	Total Fees, Expenses, and Disb'ts
Wood Billing Code	625	617	619	614	N/A	629	810				
Rate (\$/hr)											
204 - Lehigh Comprehensive Report										6%	
<i>Task Additional Hydrogeologic Investigation</i>											
1	Review of Additional Data		10					10.0			
2	1	2	12					15.0			
2.1	Vehicle + Equipment Rental										
3	Analysis of Field Data		10			1		11.0			
4	Revise Calculations		12			1		13.0			
5	1	1	24	1	4	2	2	35.0			
<i>Coordination and Compilation of Additional Information</i>											
1	Coordination/Compilation		4	4		1		9.0			
2	Project Management/Meetings		4	4			4	13.0			
Total Info Review Phase											
	10	11	68	3	4	4	6	106.0			

Appendix A – Draft Table of Contents for Comprehensive Report

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List of Acronyms and Abbreviations

- ABC Always Be Cheerful
- Etc. Et cetera