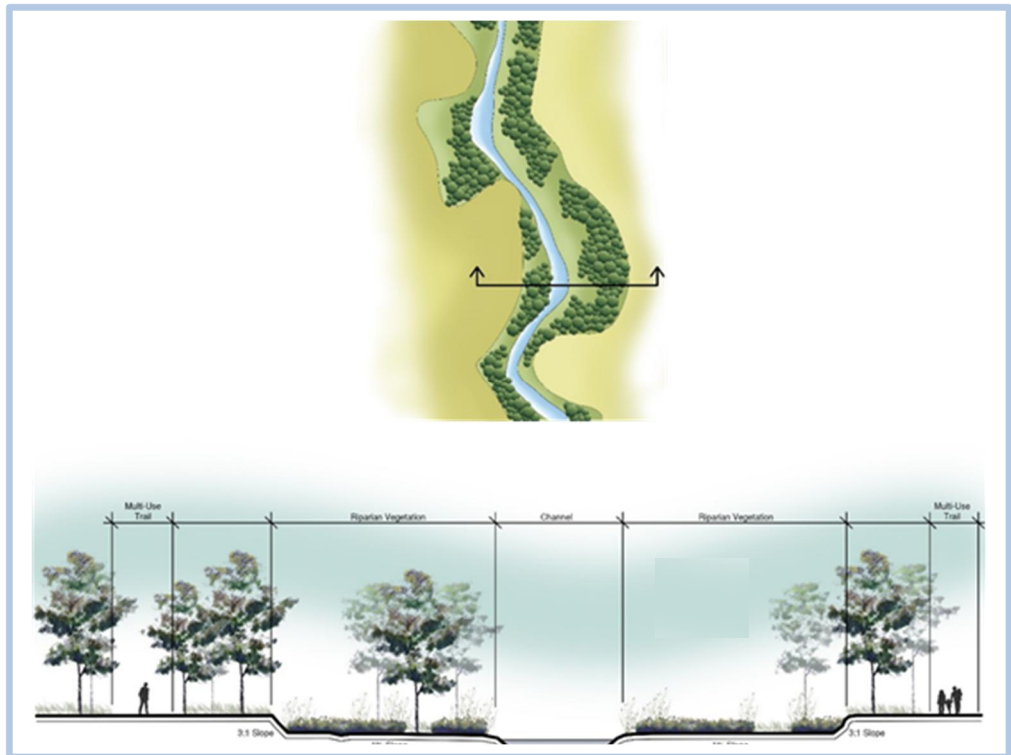
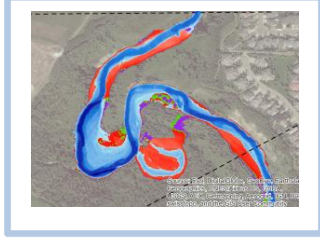
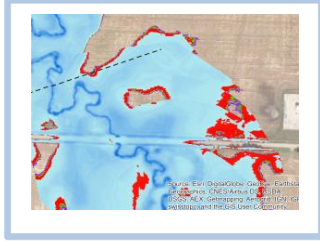


TECHNICAL MEMORANDUM NO. 5

Blackmud/Whitemud Creek Surface Water Management Group

Blackmud/Whitemud Creek Surface Water Management Study Concept Development



June 2017

CONFIDENTIALITY AND © COPYRIGHT

This document is for the sole use of the addressee and Associated Engineering Alberta Ltd. The document contains proprietary and confidential information that shall not be reproduced in any manner or disclosed to or discussed with any other parties without the express written permission of Associated Engineering Alberta Ltd. Information in this document is to be considered the intellectual property of Associated Engineering Alberta Ltd. in accordance with Canadian copyright law.

This report was prepared by Associated Engineering Alberta Ltd. for the account of Blackmud/Whitemud Creek Surface Water Management Group. The material in it reflects Associated Engineering Alberta Ltd.'s best judgement, in the light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated Engineering Alberta Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Executive Summary

This technical memo summarizes the concept development and stormwater management options developed by AE based on discussion and review of Technical Memorandum No. 4 with the Blackmud/Whitemud Surface Water Management Group. The basin model was used to simulate future flooding and hydraulic conditions related to erosion in Blackmud and Whitemud Creek with various stormwater release rates from the future development areas. These results were reviewed with the Group in a progress meeting on February 24, 2017. AE then developed a surface water management strategy to minimize and mitigate potential impacts of future development.

Localized flooding is expected to occur along the existing creeks during the design storm event with the three stormwater management release rates considered for future development (1.5, 3.0, and 5.0 L/s/ha).

Velocities and runoff volumes in the creeks will increase with development and will aggravate the on-going erosion issues in the Blackmud and Whitemud Creeks. The magnitude of this impact will depend somewhat on the release rate adopted for new development and can be minimized by adopting the lowest release rate that is reasonably practical. Continuing the existing standard for the City of Edmonton, 5.0 L/s/ha, could cause erosion rates to increase by double or more compared with the existing condition. Otherwise there is little difference in flood level or extent or the cost of stormwater management facilities (SWMFs) among the different release rates. However, adopting a release rate of 3.0 L/s/ha produces flows that are similar to the existing flows within most of the creeks except Irvine creek and LeBlanc Canal.

The City of Edmonton's design criteria have the effect of increasing the required storage volume in SWMFs by about 40%. AE recommends that the differences in design criteria be rationalized and that a uniform design criteria be adopted for the basin.

Based on the best information currently available it is concluded that climate change is unlikely to have a significant impact on storage volumes, release rates, and the basin drainage strategy.

Two alternative drainage concepts were developed for the 1:100 year design event with a release rate of 3.0 L/s/ha as agreed upon during discussions with the Group as follows:

- Constructing drainage parkways along Irvine Creek and Deer Creek to provide capacity and facilitate drainage of the adjacent lands which are otherwise too low to be drained with an underground drainage system (**Figure 3-2**).
- Constructing a network of outfall trunk sewers adjacent to the same stream channels to carry the releases from the connected stormwater management facilities to a downstream location where adequate channel capacity and depth are available (**Figure 3-7**).

The final concept plan might include a combination of the above concepts.

Blackmud/Whitemud Creek Surface Water Management Group



All proposed drainage works must be constructed in an environmentally sensitive manner. Further detailed analyses will be required to integrate existing wetlands into the urban fabric and to establish the appropriate water management strategy and water levels for existing and proposed wetlands. Caves Lake should be preserved and provided with a defined outlet to manage lake levels for habitat enhancement and to prevent flooding of the adjacent lands. A regional wetland is proposed to replace the flood storage that would otherwise be lost with channelization of Irvine Creek. Existing floodplain areas should be preserved as Environmental Reserve and protected from further development.

More detailed floodplain modelling will be required during subsequent planning stages to define the extent of the floodplains and the design requirements for any channel improvements (drainage parkways) that might be adopted.

Table of Contents

SECTION	PAGE NO.
Executive Summary	i
Table of Contents	iii
List of Tables	iv
List of Figures	v
1 Introduction	1
2 Stormwater Management Release Rates	3
2.1 Model Update	3
2.2 Stormwater Management Costs	5
2.3 Flood Extent and Depth	10
2.4 Channel Velocities and Erosion Rates	10
2.5 Effects of Increased Runoff Volume	23
2.6 Issues and Constraints	24
3 Drainage Concepts	25
3.1 Channel Improvement	25
3.2 Trunk Sewer Outfalls	33
4 Conclusions	37
Closure	
Appendix A - Model Inputs	
Appendix B - 1D Velocity Profiles Simulated With the 1D Model	
Appendix C - 2D Velocities	
Appendix D - 2D Velocity Variation from Existing Conditions	

List of Tables

	PAGE NO.	
Table 2-1	Creek Flows at Various Locations	4
Table 2-2	Estimated SWMF Costs	6
Table 2-3	Typical SWMF Parameters for Various Release Rates with 96 Hour Drawdown Time*	7
Table 2-4	Typical SWMF Parameters with Extended Drawdown*	8
Table 2-5	SWMF Design Standards in the Edmonton Region	9
Table 2-6	Estimated Runoff Volumes	23
Table 2-7	Projected Impacts of Development in the Basin	24

List of Figures

	PAGE NO.	
Figure 1-1	Future Development Areas	2
Figure 2-1	Typical Pond Cross-Section	5
Figure 2-2	Flood Extent – Blackmud Creek	12
Figure 2-3	Flood Extent – Irvine Creek	13
Figure 2-4	Flood Extent – Upper Whitemud and Deer Creeks	14
Figure 2-5	Flood Extent – Lower Whitemud and Blackmud Creeks	15
Figure 2-6	Blackmud Creek Depth Variation from Existing Flows	16
Figure 2-7	Whitemud Creek Depth Variation from Existing Flows	17
Figure 2-8	Deer Creek Depth Variation from Existing Flows	18
Figure 2-9	Irvine Creek Depth Variation from Existing Flows	19
Figure 2-10	Velocity Ratio to Existing – 1.5 L/s/ha	20
Figure 2-11	Velocity Ratio to Existing – 3.0 L/s/ha	21
Figure 2-12	Velocity Ratio to Existing – 5.0 L/s/ha	22
Figure 3-1	Proposed Drainage Parkway Concept	27
Figure 3-2	Proposed Drainage Parkways	28
Figure 3-3	Deer Creek Proposed Longitudinal Profile	29
Figure 3-4	Irvine Creek Proposed Longitudinal Profile	30
Figure 3-5	Deer Creek Drainage Parkway Concept	31
Figure 3-6	Irvine Creek Drainage Parkway Concept	32
Figure 3-7	Trunk Concept	34
Figure 3-8	Deer Creek Trunk Concept	35
Figure 3-9	Irvine Creek Trunk Concept	36

TECHNICAL MEMORANDUM NO. 5

1 Introduction

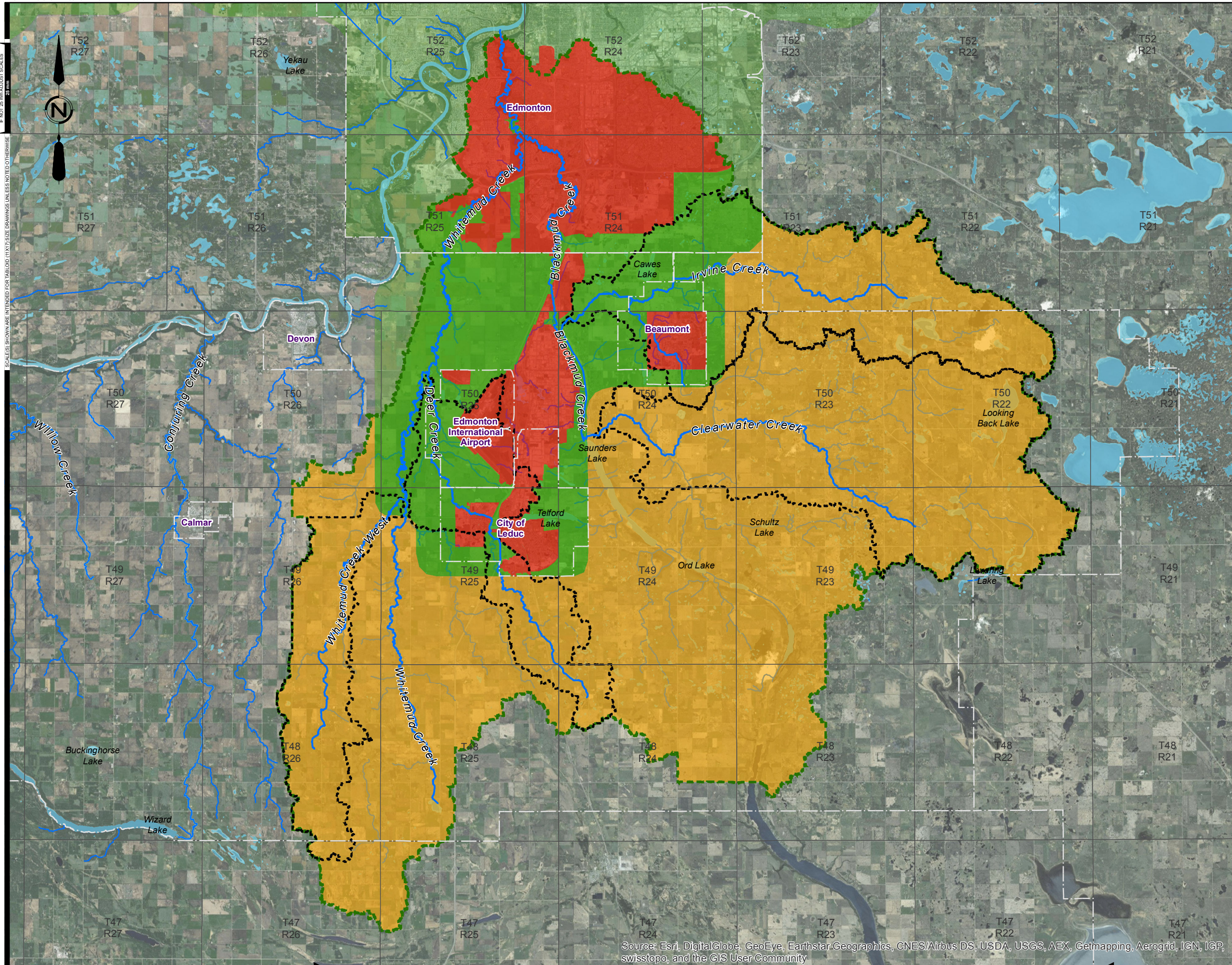
The Blackmud/Whitemud Surface Water Management Group (Group) retained Associated Engineering (AE) to complete a Surface Water Management Study. This study involved hydrologic, hydraulic, hydrogeologic and environmental analyses of the Blackmud and Whitemud Creek basins and assessment of stormwater management options to accommodate future development in the basin.

A series of Technical Memoranda (TM) was planned to be issued at key stages of the study to document the interim findings. These memoranda also meant form the basis for discussions and deliberations with the Group.

A Blackmud/Whitemud basin model was developed and simulated for existing conditions. The model development and results were previously discussed in TM No. 4 Hydrologic and Hydraulic Modelling.

This technical memo summarizes the concept development and stormwater management options developed by AE based on discussion and review of TM No. 4 with the Group. The basin model was used to simulate future flooding and hydraulic conditions related to erosion in Blackmud and Whitemud Creek with various stormwater release rates from the future development areas. These results were reviewed with the Group in a progress meeting on February 24, 2017. AE then developed a surface water management strategy to minimize and mitigate potential impacts of future development.

In Workshop #3 on December 16, 2016 the Group agreed that the Capital Region Board (CRB) Edmonton Metropolitan Region Growth Plan (2016) would be used as the future development boundary. **Figure 1-1** presents the existing and planned development areas, overlaid on a map of the basin.



- Legend:**
- Catchment
 - Classification**
 - Existing Development
 - Future Development
 - Rural
 - Creek Centreline
 - Municipal Boundary



FIGURE No. 1-1
 BLACKMUD/WHITEMUD CREEK
 WATERSHED MANAGEMENT STUDY
 FUTURE DEVELOPMENT AREAS

AE PROJECT No.	2016-3785
SCALE	1:200,000
APPROVED DATE	2017 FEBRUARY
REV DESCRIPTION	ISSUED FOR REPORT