



November 21, 2014

City of Ottawa

Infrastructure Policy Unit
110 Laurier Avenue West – 3rd Floor East
Ottawa, Ontario
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Attention: Mr. Kevin Cover, P.Eng.

Subject: MVCA Ottawa River Flood Risk Map Reporting Peer Review *our file: 1239-14*

1.0 Introduction

J.F. Sabourin and Associates Inc. (JFSA) were retained by the City of Ottawa to complete a peer review of the draft report prepared by the Mississippi Valley Conservation Authority (MVCA) titled “Ottawa River Regulatory Flood Plain Mapping Study From the Mississippi River to Watts Creek” dated September, 2014.

It is JFSAs’ understanding that the City of Ottawa, in conjunction with three Conservation Authorities including MVCA, Rideau Valley Conservation Authority (RVCA), and South Nation Conservation (SNC) has developed a five (5) year plan to update flood plain mapping within the City of Ottawa and to produce new flood plain mapping where it does not currently exist. It is also our understanding that MVCA has watershed jurisdiction of approximately 95 km in length along the Ottawa River and within the boundary of the City of Ottawa, extending from the outlet of the Mississippi River to immediately downstream of the outlet of Watts Creek. This section of the Ottawa River is the subject of MVCAs’ draft report.

It is our understanding that the basis on which the MVCA draft report and analysis has been prepared is a previous Ottawa River flood plain mapping study completed by MacLaren Plansearch in 1984. It is noted that the draft MVCA report also relies on some aspects of the analysis completed by RVCA detailed in their draft report “Ottawa River Flood Risk Mapping from Shirley’s Bay to Cumberland” dated May 26, 2014 which is attached as Appendix B to the MVCA draft report.

2.0 Scope of Peer Review

The scope of this peer review, as detailed in the letter proposal, includes the following:

1. Confirm the approach used in the draft report is consistent with the applicable technical guidelines and local standards.
2. Assess the descriptions and details in the draft report related to the hydrologic modelling and/or statistical analysis and hydraulic modelling. Confirm the report appropriately documents:
 - a. The sources of information used to complete these analyses, and
 - b. The information used is adequate in terms of accuracy, level of detail and representative of existing conditions for the purposes of flood risk mapping.

3. Confirm the report appropriately documents key information, both discussed and presented in summary tables and figures including:
 - a. Hydraulic model parameters (cross sections, bridges/culverts, boundary conditions, etc.)
 - b. Methods of calibration
 - c. Dam information
 - d. Wind, wave and ice analysis
 - e. Selection and use of model(s) used including statistical analysis of the flows and levels at the monitored locations

4. Confirm that the flood line delineation discussed in the report provides a clear presentation of the results with appropriate reference to the modelling results.

3.0 Frame Work for Peer Review of MVCA Draft Report

The Ontario Ministry of Natural Resources (MNR) produced a technical guide in 2002 titled “River & Stream Systems: Flooding Hazard Limit” (referred to as “the MNR guide” in this letter report). This MNR guide was prepared to assist in the understanding of the 1996 Provincial Policy Statement and updates to the original 1986 Flood Plain Management in Ontario, Technical Guideline Publications. This document provides a substantial level of technical guidance for flood plain mapping studies in Ontario and is currently being used for other floodplain mapping projects in the Ottawa area.

It is evident MVCA has used the MNR guide in the preparation of their draft report and the executive summary indicates that the analysis documented in their report meets the standards found in the MNR guide. In the absence of an updated publication, the MNR guide is considered a suitable reference document for the current MVCA regulatory flood plain mapping study.

As indicated in the MNR guide “It [the technical guide] is not intended to be a list of mandatory instructions or technical methodologies to be rigidly applied in all circumstances, rather it serves to assist technical staff experience in water resources in the selection of the most appropriate computational method and flexible implementation measures, provided the decisions are consistent with the latest Provincial Policy Statements”. Although the technical guide is not a list of mandatory instructions, it does provide a means by which we can assess the draft MVCA report in terms of conformance to standard methodology in floodplain mapping studies in Ontario.

This peer review focuses specifically on the draft flood plain reporting prepared by MVCA. The following sections will use the MNR guide as a frame work to address all items detailed in Section 2.0 of this letter report.

4.0 Executive Summary, Introduction, Other Studies and Study Area (MVCA Report Pages 1 and 2)

The executive summary provides an adequate overview of MVCAs' role in the identification of flood hazard lands and the applicable standards their work supports. The summary provides general details of the data sources used, the methodology employed, deliverables of the study and serves as a useful section for quick reference.

Section 1 of the draft report ("Introduction") provides a reasonable summary of the purpose of the study. JFSA recommends the following be added to the introduction:

- Add text referencing the extent of the Ottawa River that was included in the 1984 MacLaren Plansearch study to highlight that the area between the Mississippi River and Watts Creek was included and thereby provides a basis for the current study.
- Include a description of flood prone areas identified in the 1984 MacLaren Plansearch report to highlight areas of particular interest for the current study. It is noted that the Constance Bay and Armitage Avenue areas are mentioned in MVCAs' report, however, we recommend additional text be added to indicate specific areas that have been subjected to historical flooding.

Section 2 ("Other Studies") identifies the MVCA report "Investigating the Two-Zone Concept in Flood Plain Management to the Armitage Reach of the Ottawa River" dated May 16, 2014 as one of the reports used in the updated flood plain analysis. It is not completely clear which aspects of this report have been included in the updated analysis. Refer to Section 8.3 of this letter report for further commentary.

As per Chapter H of the MNR guide, it is recommended that Section 3 ("Study Area") include the following:

- Add text to identify the location of both the river crossing and the dam within the study area.
- Include the names of the main tributaries which enter the subject section of the Ottawa River from the Quebec side.
- Consider adding text referencing existing watershed characteristics (total drainage area, land use, topography, etc.), and areas subject to known development pressures.
- Consider adding text related to the driving flood-generating mechanism (spring peak flow events, etc.).

5.0 Hydrologic Analysis (ref. MVCA Draft Report Pages 4 to 6)

As previously noted, MVCA has relied on some aspects of the analysis completed by RVCA for their flood plain analysis work on the portion of the Ottawa River between Shirley's Bay and Cumberland. In particular, pages 4, 5 and 6 of the MVCA draft report include excerpts from the RVCA draft report related to the hydrologic analysis. Although it is not the intent of this peer review to assess the work completed by RVCA, JFSA has assessed the hydrologic portion for the section of the Ottawa River under MVCAs' jurisdiction, considering MVCA relied heavily on this for the hydrology portion of their flood plain mapping study.

For their hydrologic analysis, RVCA generally followed the approach from the 1984 MacLaren Plansearch study as the basis for their work. RVCA completed a flood frequency analysis, as was done in 1984 but have taken into account 28 years of additional hydrometric data that is currently available.

5.1 Selection of the Flood Plain Standard (ref. MVCA Draft Report – Page 1)

According to Figure B-1 of the MNR guide, the Mississippi Valley watershed falls within Zone 2. In general, the 100 year flood is the governing flood plain standard for this zone. The exception to using the 100 year flood for Zone 2 is if there are recorded or documented flood levels found in the same watershed which exceeded the computed 100 year flood levels. The MNR guide suggests that if the observed event

is at least 0.1 m higher than the computed 100 year water level and the watershed characteristics have not changed since the historical observation, then the historical event should be considered for flood plain standard.

A description of the selected flood plain standard is included in Section 1 (Introduction) of the MVCA draft report and includes:

- The selected flood event is the 100 year
- The source of selection is based on Ontario Regulation 153/06, item 11 and Schedule 1

With respect to the selection of flood plain standard, JFSA recommends that MVCA consider the following:

- It is recommended a review of observed water levels along the study reach be completed by MVCA and compared against the 1:100 year flood levels determined by MVCA for their current flood risk mapping. If the water surface elevation of an observed event is at least 0.1 m higher, as recommended in the MNR guide, the historical event should be considered for the flood plain standard. It is recommended this be documented in the MVCA report.
- In the absence of an observed water surface elevation in excess of 0.1 m above the 1:100 year and without knowledge of any regulation that would supersede Ontario Regulation 153/06 with respect to the flood plain standard, JFSA agrees the 1:100 year flood is the appropriate standard and it is appropriately documented in the draft MVCA report.
- It is recommended that text be added regarding conformance to the MNR guide specifically related to selection of the flood plain standard (refer to Section 3.2 of the MNR guide).

5.2 *Streamflow Records (ref. MVCA Draft Report – Page 4)*

Chapter C, Section 2 of the MNR guide indicates that an annual maximum series of peaks is generally required for a flood frequency analysis. A record of instantaneous peaks is desirable and recommended. Where instantaneous data is not available, daily data should be adjusted to reflect instantaneous values. Also, the data should be obtained from every available source and thoroughly reviewed for accuracy.

The main points of the MVCA draft report regarding streamflow records (included in Section 4 and Appendix B of the MVCA report) include the following:

- The excerpt shown on Page 4 indicates the Ottawa River gauge at Chats Falls (Water Survey of Canada, 02KF009) provided data from 1915 to 1994 and additional data was obtained from Ontario Power Generation (OPG) from 1994 to 2012.
- Tables 3 through 7 of the RVCA draft report show the flow data used at Britannia and Chats Falls gauges for the flood frequency analysis.
- It is indicated on Table 7 that the Chats Falls gauge data used for RVCAs' analysis are "Annual Daily Peak" values. This labeling is different than the flows at the Britannia gauge which are identified as "Annual Instantaneous Peak" values.

With respect to streamflow records, JFSA recommends MVCA consider the following:

- Include a discussion or proper reference in their report on the review of the streamflow data received and evaluation of its accuracy.
- Include confirmation in the report text whether the stream flow data at Chats Falls and Britannia gauges used for the hydrologic analysis represent maximum annual instantaneous peak flows or otherwise. If all values are not representative of instantaneous peak flows, justification should be provided for the comparison between these gauges and selection of the Chats Falls data.
- It is recommended if any of the stream flow data was not used (because it was deemed inaccurate or otherwise) or required manipulation (from maximum daily to peak instantaneous for example),

that justification be provided in the reporting.

5.3 Statistical Analysis (ref. MVCA Draft Report – Page 4)

The MNR guide indicates that in a flood frequency analysis, the initial assumption is that floods are random and independent events that can be described by a particular probability distribution. To determine whether stream flow data can be used for a frequency flood analysis, it must be validated for independence, trend, homogeneity and randomness through statistical analysis.

Page 4 of the MVCA draft report provides reference to the statistical analysis of gauge data completed by RVCA and indicates the statistical analysis tests are all satisfied, thereby confirming the suitability of the gauge data for use in a flood frequency analysis without any adjustment. Appendix A of the RVCA report indicates that the statistical analysis was completed using a combination of coded and built-in functions in R (R Core Team, 2012). Subsequent R output files were provided in Appendix B. It is noted that RVCA has completed an exercise to replicate the statistical analysis results of the 1984 study which “performed well and provided close matches to reported results”.

With respect to the statistical analysis, it is JFSAs’ opinion that it is sufficiently documented in the RVCA report and adequately referenced by MVCA in their report. JFSA recommends MVCA consider the following:

- It is not clear why Environment Canada’s Consolidated Frequency Analysis (CFA) software was not used for statistical analysis to assess suitability of the data as it has the capability of doing this and was the chosen program to complete the flood frequency analysis. It is recommended MVCA discuss this with RVCA and include text in their report accordingly.

5.4 Flood Frequency Analysis (ref. MVCA Draft Report – Pages 4 and 5)

According to the MNR guide, the following are important elements to consider in determining whether a single station flood frequency analysis can be used:

- The record must be sufficiently long (ie: 30 to 40 years) and reliable.
- Instantaneous peak flows should be analyzed whenever possible.
- The record should be checked for ice or log jams.
- Analysis of stream flow data for various probability distributions can be done using CFA software by Environment Canada.
- Graphical estimates should not be used alone in determining which distribution best describes a given data sample. Graphical estimates should be done in conjunction with other factors such as the variances of the estimates and, where applicable, the confidence limits.

MVCA provides an excerpt from the RVCA report indicating that an analysis was completed for Carillon, Britannia and Chats Falls gauges using Environment Canada’s CFA software. The data set at each gauge was analyzed using four probability distributions with the best fit being the three-parameter lognormal distribution. The analysis completed for the Chats Falls dam gauge was chosen by MVCA for a single station frequency analysis for their floodplain study.

JFSA provides the following comments and recommendations for the flood frequency analysis:

- The Chat Falls gauge data includes almost 100 years of flow data (1915 to 2012) and therefore has a sufficient length of record for flood frequency analysis.
- As per Section 5.2 of this letter report, it is recommend MVCA confirm whether the gauge data used for this flood frequency analysis represents instantaneous peak flows or otherwise.

- It is recommended the gauge records be checked for ice or log jams and add text to the report detailing this review.
- It is recommended MVCA provide further justification for choosing Chats Falls gauge for a single station frequency analysis instead of regional flood frequency analysis considering the study area under consideration spans a length of approximately 95 kilometers.
- It is recommended that MVCA provide further justification for the selection of the three-parameter lognormal distribution for Chats Falls. It is worthwhile to refer to Section 2.3.3 of the 1984 report which provides description of statistical goodness-of-fit tests and subsequent justification for their distribution selection at that time.

5.5 Correlation of Chats Falls and Britannia Discharges (ref. MVCA Draft Report – Page 5)

The MVCA report provides an excerpt from the RVCA report which indicates that an assessment was completed by RVCA to determine whether the longer Chats Falls record should be used at Britannia. The assessment concludes that there is a strong correlation between the two stations and as a result the Chat Falls record is used for the flood frequency analysis to determine peak flow inputs to the hydraulic model.

With regard to the correlation between the Chats Falls and Britannia gauges, JFSA is not certain that the supporting report descriptions and graph (RVCA Figure 6) clearly indicate a strong correlation. In particular, Figure 6 shows that between 1960 and 1980, flows at the Chats Falls gauge are generally higher whereas after 1980, flows at the Britannia gauge are generally higher. It is recommended that MVCA investigate the correlation and provide further justification for selecting the Chats Falls Gauge for their subject reach on the Ottawa River. It may be worthwhile to plot a graph of Chats Falls discharge vs. Britannia discharge to better assess the correlation.

5.6 Effect of Dams on Hydrology (ref. MVCA Draft Report – Page 5)

According to the MNR guide, the first step in a flood frequency analysis is to determine the influence of regulation on streamflows. Chapter C, Section 2.9 of the MNR guide indicates that if the river is subject to significant artificial regulation by dams, diversions, etc., that have significant effects on peak flows, it is necessary to obtain data on the effect of this regulation to enable conversion of stream flows to natural conditions prior to undertaking a flood frequency analysis.

The final paragraph of Page 5 of the MVCA report concludes that “dam operations have no influence on the regulatory flood limit delineation for the study area”. This conclusion is predicated on correspondence in 2012 between the Ottawa River Regulation Planning Board (ORRPB) and RVCA and MVCA staff indicating that dam operations have some beneficial effects on frequently occurring runoff but no perceptible effect on moderate and rare events.

JFSA recommends that the MVCA discuss with RVCA and/or the ORRPB the quantitative values relating to “moderate and rare events”. If “moderate and rare events” include the 1:2 year to 1:100 year, then it may be reasonable to assume that a conversion of stream flows to natural conditions is not warranted. It is recommended this be confirmed and documented in MVCAs’ report.

JFSA recommends that MVCA make reference to the 1984 floodplain study section 2.1. This section indicates that the operation of Ottawa River dams is drastically reduced during the spring month runoff months and the operation even at the major facilities becomes “run-of-the-river”. Providing this reference gives some additional justification for use of hydrometric data from 1984 and earlier in that it speaks to the historical effect of the Ottawa River dams on peak flows.

Additionally, JFSA recommends that MVCA contact OPG and/or ORRPB to obtain information related to past dam break analyses for Chats Falls Dam. Although this information may not be needed to determine regulatory flood lines, it may be important to identify the potential risk of flooding due to a dam break at Chats Falls. This information may be used by MVCA in a similar context to the wind and wave analysis (refer to Section 6.6 of this peer review) in which the associated flood risk is assessed on a site by site basis. It is recommend text be added to the MVCA report accordingly.

6.0 Hydraulic Analysis (ref. MVCA Draft Report Pages 6 to 10)

6.1 Approach (ref. MVCA Draft Report - Page 6)

It is noted that HEC-RAS (version 4.1.0) was the selected model for backwater computations. This model is widely used in Ontario, used for other floodplain mapping projects in the Ottawa area including the previous 1984 study (using HEC-2, predecessor or HEC-RAS), and considered sufficient for this flood plain study.

It is indicated on Page 6 of the MVCA draft report that the HEC-2 model prepared for the MacLaren Plansearch 1984 study was imported into their HEC-RAS model as a base and updated/revised where required.

It is recommended that MVCA prepare a table for direct comparison between the HEC-2 results and those obtained once it has been imported and run in HEC-RAS. If there are any significant differences in results (water surface elevations, velocities, etc.), these differences should be documented and explained. In addition, it is recommended that any revisions made to the model be documented, along with justification for any changes in results.

6.2 Cross Sections (ref. MVCA Draft Report – Page 7)

With regard to the use of the LIDAR data, the RVCA draft report attached to MVCAs identifies that verification of the LIDAR data was done by RVCA using GPS equipment and justification was provided where discrepancies were noted. It is not clear, however, whether this verification included the area for which the MVCA draft report was prepared. It is recommended that MVCA confirm with RVCA, if the verification exercise completed by RVCA is also applicable to their area of study and document it in their reporting.

It is noted that the channel bathymetry was taken from the MacLaren Plansearch (1984) study considering the recent LIDAR data received does not pick up the underlying riverbed elevations. It is recommended that MVCA follow a similar procedure as RVCA using the Canadian Hydrographic Service digital charts and any other available data to confirm that the Ottawa River bathymetry between the Mississippi River and Watts Creek has not changed significantly since the 1984 study. The outcome of this assessment should be documented in MVCAs' reporting.

It is recommended MVCA prepare plans similar to RVCA Figures 10(a-e) to show location and alignment of cross sections. These figures would serve as a useful reference consolidating cross section locations subsequent to the flood plain maps. It is also recommended MVCA append plots of all HEC-RAS cross sections and profiles to their report.

6.3 Bridges and Culverts (ref. MVCA Draft Report – Page 8)

According to the Chapter B, Section 4.2 of the MNR guide, the upstream flood line should make allowance for the backwater effects of the structure. Downstream of the bridge, the natural flood line should be used for delineating flood hazard, making no allowance for the effect of temporary upstream ponding.

The MVCA report indicates that there is only one bridge within the study area; the CN Rail Bridge near Morris Island upstream of Chats Falls. MVCA also indicates that they are not aware of any alterations made to the bridge since the preparation of the study (1984 MacLaren Plansearch study).

JFSA provides the following comments and recommendations regarding the bridges and culverts:

- It is recommended MVCA confirm with CN Rail that the geometry information MVCA has matches existing conditions of the bridge and to include verbiage in the report accordingly. Also, it is recommended to include any as-built drawings in an appendix if they are available from CN Rail or otherwise. From a cursory review in Google Earth, it appears there may be additional piers along this bridge which are not included in the HEC-RAS modelling used for the MVCA study.
- It is recommended to include text in the report to confirm the approach used by MVCA matches the approach from 2002 MNR manual regarding how the flood lines upstream and downstream of this bridge were done. In this particular case, it may be sufficient to test the change in water level and subsequent change in upstream volume by temporarily removing the CN rail bridge from the HEC-RAS model. Comparing this change in volume to the 1:100 year peak flow will likely highlight the fact that the storage upstream of this bridge is insignificant during a 1:100 year event.

6.4 Boundary Conditions (ref. MVCA Draft Report – Page 8)

It is noted that MVCA has separated the hydraulic model into two segments. JFSA agrees that this is necessary as the initial water level for commencing backwater computations is not uniform through the subject area due to the presence of Chats Falls Dam.

For the boundary condition of the upstream model (cross sections 3011 to 3001) it is noted that MVCA relies on the 1984 MacLaren Plansearch study which was determined from Ontario Hydro's forebay operating curves at that time. It is recommended that MVCA confirm with the current dam operator (OPG), if they haven't already been done so, whether the current operating curves are consistent with those included in the 1984 MacLaren Plansearch report. If the operating curves are different, it will be necessary to update and justify the downstream boundary water levels for the current study. Justification should be included in the report text.

6.5 Manning's n Values and Calibration (ref. MVCA Draft Report – Page 9)

It is recommended that MVCA follow a similar procedure used by RVCA to calibrate their HEC-RAS models (including their selection of Manning's n values). Considering MacLaren Plansearch calibrated the HEC-2 model for which the MVCA HEC-RAS model is based, little adjustment is likely necessary. However, considering MVCA has made updates to both the hydrologic and hydraulic models it is prudent to complete a calibration exercise.

Ideally, as indicated in the 2002 MNR guide, it is recommended the models be calibrated against one set of flood levels and verified against a different set. Once the calibration exercise is completed, it is

recommended MVCA provide comparison between modelled and observed flows and justify the calibration confirms the reasonableness of the model for the purpose of flood plain delineation.

6.6 Wind Wave Analysis (ref. MVCA Draft Report – Page 10)

It is noted that the 1984 MacLaren Plansearch study indicates that no adjustment to the flood line has been made to include wave run-up. It was recommended in that study to consider wave run-up separately but in conjunction with the design flood level. It is also JFSAs understanding that this wind and wave analysis would be completed on a site by site basis, as indicated by MVCA on page 10 of their draft report.

It is recommended that MVCA consider including text in the report regarding potential areas where the wind and wave analysis is likely to be required within this reach of the Ottawa River. According to the 1984 study, that would include Marshall Bay, Shirley's Bay and Constance Bay.

7.0 **Flood Line Delineation (ref. MVCA Draft Report – Page 10)**

JFSA recommends that MVCA review RVCAs' report section "Flood Line Delineation" and add text regarding the following items as they relate specifically to MVCAs work:

- Indication of whether raw LIDAR spot heights were used in plotting the flood plain.
- Checking of the floodplain once it was plotted.
- Procedure followed to delineate the flood plain on tributaries.
- Caution the future use of the flood plain elevation on tributaries and the need for additional analysis (for example, a combined probability analysis may be required to sufficiently establish the flood plain on the downstream reaches of tributaries).

8.0 **Additional Considerations**

8.1 Sensitivity Analysis

It is recommended a sensitivity analysis be completed by MVCA to assess the impact of variations or uncertainties in the calibrated model parameters (once the calibration exercise has been completed). According to the 2002 MNR guide the following parameters are normally considered:

- Peak flow discharge
- Channel and flood plain roughness
- Expansion and contraction coefficients
- Starting water levels
- Channel configuration including spacing, location and definition of cross sections
- Ice-jamming and debris blockage and
- Sedimentation and sand bars

It is recommended, at a minimum, that MVCA consider peak discharge and Manning's roughness for the sensitivity analysis as these are usually found to be the most sensitive parameters. It may be beneficial to also investigate the sensitivity of starting water levels for the downstream model considering RVCA's work is still in draft form and also the starting water levels for the upstream model at Chats Falls dam if there is thought to be uncertainty in the derivation of these levels.

Sensitivity of channel configurations should be considered. It is noted there are a number of cross sections in the HEC-RAS models where divided flow occurs which may not be indicative of existing conditions.

Checking the sensitivity of using ineffective flow areas and/or levees to maintain flow in the floodway is recommended.

8.2 Split Channel Flow

According to the MNR guide, when discharge is separated into two or more channels by the presence of islands within the floodplain, it is necessary to determine proper division of flow in each channel and the corresponding water surface elevations.

JFSA recommends that MVCA provide a description in the reporting on how the islands located within the subject reach of the Ottawa River were modelled, whether a split flow analysis was completed (for Ile Mohr for example) and to add justification in the report text accordingly.

8.3 Two Zone Concept

According to the MNR guide, under a two-zone concept, a floodway has to be separated from the flood fringe of a flood plain. The floodway in this case is defined as the stream channel and that part of the flood plain required to convey the majority of the flood.

It is not clear to JFSA whether a two zone concept has been applied to MVCAs flood plain modelling or mapping. It is noted that the draft flood plain maps include a distinction between “Proposed Regulatory Floodplain” and “Floodway”; however a description of this distinction is not provided in the reporting. Similarly, Section 2.0 of the MVCA report indicates that a MVCA document titled “Investigating the Two Zone Concept in Flood Plain Management to the Armitage Reach of the Ottawa River”, dated May 16, 2014 by MVCA was used in the updated flood plain analysis, however further details are not provided in the reporting. Therefore, JFSA recommends that MVCA document this clearly in their reporting as it relates to the hydraulic modelling and flood line delineation.

8.4 Ice Jams

According to the MNR guide, a water level increase due to an ice jam can be considerable, leading to more widespread flooding than a flood of much larger magnitude without the jam occurring. Downstream of a jam, a normal procedure would be followed for a specified flood. At the jam, a new initial water surface elevation must be specified to compute the profile for the upstream reach. Estimates of the effect of jams should be based on past history at that location.

JFSA recommends that MVCA review the data stream flow records and confirm with OPG or other entities whether there have been any ice jams in the past along this reach of the Ottawa River including at Chats Falls Dam. If ice jams have been known to occur, their effects should be included in the hydraulic analysis.

We trust the peer review comments enclosed will assist the City of Ottawa and MVCA toward the completion of this floodplain mapping project.

Respectfully submitted,



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