4.0 FILL LINE DELINEATION

Certain areas, outside the Regulatory flood plain itself, may not be suitable for development because of the potential risk of erosion and/or slope failure. In other areas, some regulation is required to ensure that excavated material is not deposited in the Regulatory flood plain.

In consultation with the Conservation Authority and the Project Team, guidelines were adopted in order that Ecos Garatech could delineate the fill line for Upper Bell Creek. Basically, the guidelines are as follows:

(1) The fill line will be plotted as a dashed line and will be located outside of the Regulatory flood plain and exclude, wherever possible, existing buildings whilst at the same time ensuring a margin of safety for future development.

(2) The fill line will be plotted as a straight line and, wherever possible, follow existing features such as fence lines, roadways, bush lines, buildings, etc.

(3) The fill line, in areas where existing features and steep slopes are not prevalent, will have a minimum set back of fifteen (15) metres from the Regulatory floodline.

(4) The fill line, in areas of steep slopes (greater than fifteen (15) percent), will be set back a reasonable distance from the break in slope.

(5) The fill line may, in certain areas, be a combination of any of the four (4) thereof.

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY AND CONCLUSIONS

As a result of the hydrologic and hydraulic analyses the following are noted:

(1) The peak flood flows for the various return frequency events were determined for Bell Creek in the City of Belleville and the Township of Thurlow, as a result of updating the K and Tp values given in the 1984 report.

(2) The Manning's 'n' sensitivity analysis demonstrated that a 10% deviation in the values would not significantly alter the simulated Regulatory flood plain.

(3) The Canadian National Railway and Highway No. 401 structures can discharge the various flood events, without weir flow occurring over the roadway embankment.

(4) For the 100 year storm event, the total head loss through the structures varied from 0.01 m at County Road No. 18 to 3.16 m at the Highway No. 401 crossing.

(5) In reviewing the flood plain of Upper Bell Creek, it was estimated that 9 buildings are within the 100 year flood plain. The buildings are located immediately upstream of County Road No. 18.

The extent of flooding within the study area of Upper Bell Creek, as a result of the Regulatory (100 year) storm and the corresponding fill line were plotted on the Moira River Conservation Authority's Flood Risk Mapping, Sheet Nos. 1 to 8.

For the Lower Bell Creek area, the 100 year lake flood elevation of 76.20 m was superimposed on the backwater simulations at the Bay of Quinte. The backwater effect of 76.20 m ends at about 70 m downstream of Highway No. 2.

5.2 RECOMMENDATIONS

In order to establish limits of community development and institute land use practices consistent with environmental limitations, the following measures are recommended:

(1) The Moira River Conservation Authority accept the flood and fill lines as delineated on the Flood Risk Maps, Sheet Nos. 1 to 8, as the extent of hazard lands designation adequate for future zoning. That is, the lands lying within the flood and fill line delineations be considered as being susceptible to flooding and subject to erosion and potential slope failure.

(2) The City of Belleville and the Township of Thurlow, in cooperation with the Conservation Authority, prepare Official Plan Policies, Zoning By-Laws and Master Drainage Plan covering the regulations of the Bell Creel watershed, in accordance with Provincial objectives of water management.

(3) The developed hydraulic computer models should be used to assess the effect of any proposed changes to the Bell Creek system. Should any proposed changes be constructed, then the computer models should be updated to reflect current hydraulic conditions.

6.0 INTRODUCTION

6.1 GENERAL

Ecos Garatech Associates Limited (EGA) was retained by the Moira River Conservation Authority to complete a Flood Plain Mapping and Storm Water Management Study for the Bell Creek Watershed. The watershed is comprised of land in the east of the City of Belleville and in the south of the Township of Thurlow. The objective of this study is to ensure that the storm water runoff, produced by increasing urbanization in the watershed, is managed in a manner consistent with the ideals and objectives of the Moira River Conservation Authority, the City of Belleville and the Ministry of Natural Resources.

6.2 BACKGROUND

The majority of the Bell Creek Watershed is currently undeveloped. However, development is projected over much of the basin. This development will translate into a major increase in runoff and if left uncontrolled, will lead to an increased incidence of flooding and erosion control problems.

Attenuating flows will not only maintain pre-development conditions but will also protect the natural channel from erosion or bank instability. Where design of the major system requires utilizing the channel to convey overland flows to a storm water pond, channelization must occur ensuring not only sufficient design capacity but also that erosion control and bank stability be addressed.

At present there are no Storm Water Criteria and Guidelines for either the City of Belleville or the Township of Thurlow, nor are there any Master Drainage Plans for Bell Creek in these Municipalities.

EGA completed the Flood Plain Mapping for the Upper Bell Creek area and at that time flood lines were also regenerated for Lower Bell Creek. It was determined that this would be the time to proceed with the development of Storm Water Management Guidelines due to the recent hydrologic and hydraulic studies (Part A of this Report) completed as well as the current development pressures on the watershed. Therefore the purpose of this document is to encourage well planned development within the watershed while at the same time addressing the following objectives:

(a) prevent loss of life and minimize property damage

(b) eliminate or reduce to the minimum, surface ponding and flooding causing inconvenience.

(c) minimize the effect of development on Bell Creek

(d) avoid flooding and erosion downstream of developments

(e) minimize the impact of water quality from urbanized areas

(f) eliminate adverse effects of construction activities on Bell Creek

(g) minimize the total cost of the drainage system and related works by using the latest proven design and construction techniques.

6.3 STUDY AREA

The Bell Creek Watershed comprises approximately 23.3 km2 of urban and rural land on the east side of Belleville. The recent annexation by the City has enclosed about 7 km2 within the City boundary and Thurlow comprises the other 15.3 km2. Development trends indicate that the ultimate post development land use for the watershed will be residential and industrial as shown on Figure 6.1.

6.4 CRITERIA

In order that development may proceed uninhibited from neighbouring lands the following criteria were adopted to control post-development runoff:

(a) **Hydrotechnical**

Storm water management will involve the use of the Major - Minor System Concept.

Storm water runoff facilities and controls for the minor drainage system will be of required capacity for the 5 year design event or less frequent event as dictated by the local municipality.

Storm water runoff facilities and controls for the major drainage system will be required to maintain pre-development runoff for the 5, 10, 25, 50 and 100 year storm events.

(b) **Residential**

Storm water runoff facilities and controls for the major drainage system can be located:

i) on-site (within the proposed development lands)

ii) off-line (adjacent to watercourse proper or tributary)

iii) on-line (on watercourse proper or tributary)

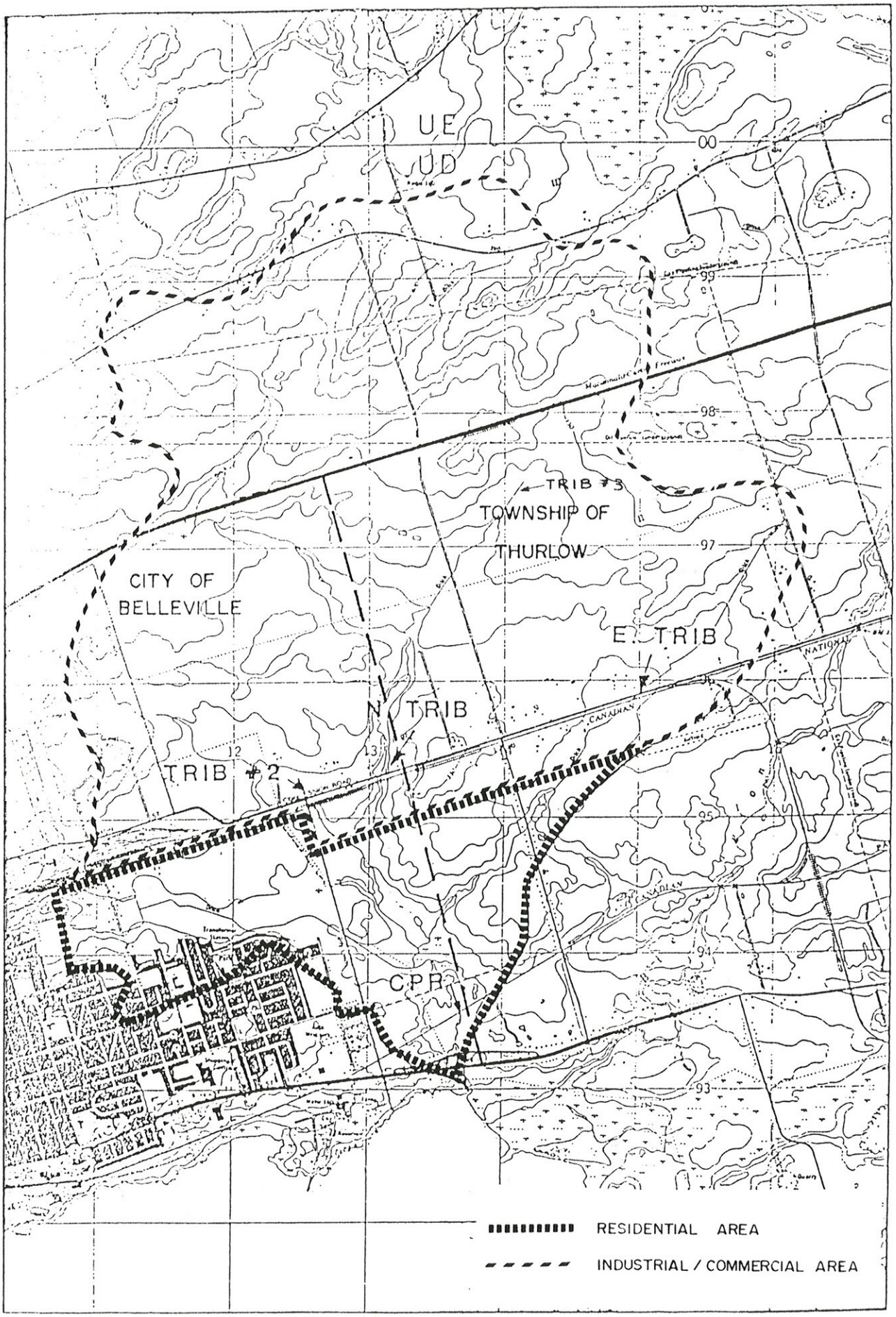
The general desire would be to locate the facility either on-site or off-line. Every proposal for an on-line facility must address clearly the reasons for not considering the preferred options. Furthermore, any proposed on-line facility must provide additional storage capacity for the control of the increase in volume of runoff from the proposed upstream developments.

Complete hydrotechnical evaluations will be required to support location, size, control structure, erosion and environmental concerns, and operation and maintenance.

(c) **Industrial and Commercial Development**

Storm water facilities and controls for the major drainage system will be required to be located within the proposed site of the development. Pre-development conditions must be maintained at property boundaries.

Complete hydrotechnical evaluations will be required to support type of control facilities whether they be storage facilities in designated landscape areas, parking lots, minor system, or on rooftops.



FUTURE DEVELOPMENT - BELL CREEK AREAS

FIG. 6 - 1