MEMORANDUM TO: MANAGEMENT TEAM
FROM: [Redacted]
DATE: 15.2.93
SUBJECT: DRAINAGE WITHIN THE SHIRE OF FLINDERS

The recent wet winter has provided us with stark evidence of the generally poor standard of our urban infrastructure drainage system. In addition we have been reminded of the impact of development encroaching into what are natural retarding basins.

A study carried out recently by Melbourne Water on the Tootgarook Plain makes several interesting observations which are included on the attached sheet at 2.3.

I am of the view we should prepare a comprehensive drainage plan for West Rosebud immediately with a view to identifying a works program and funding options and secondly we should look at prioritising other areas of the Shire where drainage works/flooding mitigation are required. This assumes the Rosebud central drainage works will continue at present and meet the base criteria of 100 year flood level capacity.

The Council could defer its responsibility to Melbourne Water who could decide to accept responsibility and levy rates within the Shire to cover the cost of drainage works. I would favour the Council pursuing the matter and utilising the expertise of Melbourne Water on a contractual basis as required.

If there is general agreement at Management I would be happy to provide input to a Council report to enable work to proceed towards securing MEIPS funding for the drainage plan.

MANAGER PLANNING AND ENVIRONMENTAL SERVICES

Melb Water are drainage Auth. for Metro area which includes us - can declare it they wish.
1. INTRODUCTION

The Shire of Mastfrigs has received two subdivision development proposals and a proposal to enhance the wetland system within the Tootgarook Flood Plain in Rosebud West. To get a better understanding of the impact of the proposed developments on drainage, the Shire commissioned Melbourne Water to undertake a catchment study to:

(a) estimate the 1 in 100 years flood levels in Tootgarook Flood Plain under existing conditions

(b) assess any likely flooding problems along Chinaman's Creek

(c) assess the impact of the proposed developments on flood levels within the flood plain and flooding along Chinaman's Creek

(d) determine drainage requirements for developments

(e) provide estimated 5 and 100 years peak flows at selected locations within the catchment

The study is mainly concerned with drainage issues and does not cover the impact of developments on wetlands in the flood plain.

2. CATCHMENT MODELLING

The Tootgarook catchment, situated in Rosebud, has a catchment area of about 42 sq. km at Chinaman's Creek just upstream of Eastbourne Road (see Figure 1). The existing land use is predominantly rural and market gardening. Tootgarook Flood Plain covers an extensive area of approximately 450 ha between the retirement village and Limestone Road. The flood plain acts as a natural retarding basin with Chinaman's Creek as its outlet.

2.1 Data

The data used in this study is summarised as follows:

Rainfall - Design rainfall depths and temporal patterns based on Australian Rainfall and Runoff (1987 edition)

Survey - Flood plain storage data within Hiscock's property provided by Sharp Design Studio Pty. Ltd.

- Flood plain storage between Browns Road and Limestone Road and between the eastern boundary of Hiscock's property and Boneo Road estimated based on available contour plans
Figure 1 Tootgarook Catchment
2.2 RORB Modelling

Computer rainfall-runoff model RORB has been selected to model the Tootgarook catchment. RORB is an event based hydrologic model which estimates the catchment runoff from a given rainfall event (Ref. 1). Tootgarook Flood Plain has been modelled as a retarding basin. The model parameters and stage-storage-discharge relationships are summarised in Appendix A.

2.3 Results

Different design storms with duration ranging from 1 hour to 72 hours were modelled. The results are summarised as follows:

- The estimated 1 in 100 years flood level in Tootgarook Flood Plain under existing conditions is approximately 2.7 m AHD.
- The estimated 100 years peak flow for Chinaman's Creek downstream of the retirement village is about 11 m³/s.
- A rough estimate of the 100 years flood level along Chinaman's Creek is about 2.7 m AHD between the retirement village and Eastbourne Road. From Eastbourne Road to Nepean Highway, the estimated flood level is about 2.5 m AHD. The flood levels along Chinaman's Creek are mainly controlled by the road levels of Eastbourne Road and Nepean Highway (low points at about 2.6 m and 2.5 m AHD respectively) and their culvert capacities (approximately 5 m³/s and 8 m³/s respectively). A water surface profile analysis is required to provide a more accurate estimate of the flood levels.
- In general, the top of bank profiles of Chinaman's Creek range from about 1.0 m to 3.0 m AHD with an average level of about 2.0 m AHD along most of the creek. Notable low spots are in the vicinity of Eastbourne Road and the retirement village. Breakaway flows are expected to occur at these low spots causing more regular flooding problems.
- Based on the survey information covering a limited area adjacent to the creek, it appears that a significant area on both sides of the creek, downstream of these development proposals, is subject to inundation from a 1 in 100 years flood event. Detail survey of the area, including building floor levels, is required to provide an accurate mapping of the extent of inundation.
- The estimated flood storage losses for the two proposed subdivisions, Hiscock's Estate and Curlew Height Estate and the proposed wetlands are approximately 40,000 m³, 75,000 m³ and 150,000 m³ respectively. The total loss of flood storage is about 10% of the total existing storage at 2.7 m AHD. The impact on flood level due to the total loss of storage is to increase the flood level by approximately 0.1 m, i.e. to 2.8 m AHD.
The impact on peak flow and flood levels along Chinaman's Creek due to loss of storage is expected to be minimal because the outflow from the flood plain is essentially a function of available flood storage within the flood plain and the flood levels are controlled by the existing road levels and the culvert capacities. However, it should be pointed out that it is generally true that when examining the impact of a development, which results in a small loss of flood storage within a flood plain, in isolation, the impact due to the individual development is usually not significant. It is the cumulative impact of each individual development and hence the total loss of available flood storage which should be used to assess the overall impact.

The estimated 5 and 100 years peak flows at selected locations within Tootgarook catchment are given in the table below:

<table>
<thead>
<tr>
<th>Location (see Fig 1)</th>
<th>Q_5 (m³/s)</th>
<th>Q_{100} (m³/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinaman's Ck at Limestone Rd</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>Chinaman's Ck at Browns Rd</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>Cnr Browns and Boneo Rds</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Drum Drum Alloc Ck at Jetty Rd</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Drum Drum Alloc Ck at Old Cape Schank Rd</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Drum Drum Alloc Ck at Boneo Rd</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Chinaman's Ck at Eastbourne Rd</td>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>

3. DRAINAGE REQUIREMENTS

In considering the approval of the two proposed subdivision developments, it is suggested that the following drainage requirements should be adopted:

(a) Fill level should be at least 3.2 m AHD, i.e. with a freeboard of 400 mm above the estimated 100 year flood level.

(b) Fill should be gained from the flood plain to minimise/compensate the loss of flood storage subject to the Shire's approval. Impact of extracting fill material from within the flood plain on flood storage compensation, wetland and other environmentally sensitive areas must be taken into account.

(c) The proposed extension of Elizabeth Avenue crossing Chinaman's Creek should be designed to handle the 100 years peak flow from Tootgarook Flood Plain plus the spillway flow should the flood plain be designed as a retarding basin with a controlled outlet.

(d) A 30 m wide drainage reserve or easement along Chinaman's Creek should be obtained for future drainage works.

(e) All drainage requirements must be carried out to the Shire's satisfaction.

4. CONCLUSIONS

The main conclusions of the study are:

(a) The estimated 1 in 100 years flood level in Tootgarook Flood Plain under existing condition is approximately 2.7 m AHD

(b) The proposed subdivision developments and wetland system have an impact of increasing the 100 year flood level in the flood plain by about 0.1 m and a minimal impact on the existing flood levels along Chinaman's Creek downstream of the proposed developments. When taking these developments in isolation, the impact may be considered to be not significant on the existing drainage system. However, an overall development plan for the whole flood plain should be developed to conform to the ultimate permissible drainage and environmental constraints rather than to consider each development in a piecemeal fashion

(c) Based on the survey information covering a limited area adjacent to the creek, it appears that a significant area on both sides of the creek, downstream of these development proposals, is subject to inundation from a 1 in 100 years flood event. Detail survey of the area, including building floor levels, is required to provide an accurate mapping of the extent of inundation

(d) Preservation of flood storage within Tootgarook Flood Plain and the upgrading of Chinaman's Creek and culvert capacities to a higher and more uniform standard of protection along its entire reach are important factors in developing a successful drainage strategy for Tootgarook Catchment. Further loss of flood storage will result in increases in upstream flood levels and flows into Chinaman's Creek with a resultant increase in flood problems

5. RECOMMENDATIONS

It is recommended that the Shire:

(a) develops an overall drainage (and wetland and other environmental) strategy for Tootgarook catchment. This strategy should take into account fully utilising the flood storage within Tootgarook Flood Plain, ensuring that there is no further loss of flood storage with future development, increasing the flood protection for properties along Chinaman's Creek and identifying the level of developments given the drainage and other constraints

(b) Considers adopting the drainage requirements in Section 3 as a condition of development in appraising the proposed subdivision developments

(c) Undertakes a survey covering the entire Tootgarook Flood Plain to determine a more accurate estimate of available flood storage, Chinaman's Creek (including cross-section details) and the adjacent area (including building floor levels) to obtain an accurate mapping of the area subject to inundation from a 1 in 100 years flood event
6. REFERENCES


APPENDIX A - Data and Model Parameters used in RORB

A.1 Adopted RORB model parameters:

\[ k_c = 12, \ m = 0.8 \]

Initial Loss = 25 mm/h, Continuing Loss = 2.5 mm/h

A.2 Stage - storage - discharge table for Tootgarook Flood Plain:

<table>
<thead>
<tr>
<th>Stage (m AHD)</th>
<th>Pre-Development Storage (m³)</th>
<th>Post-Development Storage (m³)</th>
<th>Discharge (m³/s)</th>
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</thead>
<tbody>
<tr>
<td>1.0</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>1.2</td>
<td>2,000</td>
<td></td>
<td>2.6</td>
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<td>2,900,000</td>
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