

WOLLONGONG CITY COUNCIL



WOLLONGONG CITY FLOOD STUDY

FINAL



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FOREWORD

The NSW State Government's Flood Policy provides a framework to ensure the sustainable use of floodplain environments. The Policy is specifically structured to provide solutions to existing flooding problems in rural and urban areas. In addition, the Policy provides a means of ensuring that any new development is compatible with the flood hazard and does not create additional flooding problems in other areas.

Under the Policy, the management of flood liable land remains the responsibility of local government. The State Government subsidises flood mitigation works to alleviate existing problems and provides specialist technical advice to assist Councils in the discharge of their floodplain management responsibilities.

The Policy provides for technical and financial support by the Government through four sequential stages:

1. ***Flood Study***
 - Determine the nature and extent of the flood problem.
2. ***Floodplain Risk Management Study***
 - Evaluates management options for the floodplain in respect of both existing and proposed development.
3. ***Floodplain Risk Management Plan***
 - Involves formal adoption by Council of a plan of management for the floodplain.
4. ***Implementation of the Plan***
 - Construction of flood mitigation works to protect existing development, use of Local Environmental Plans to ensure new development is compatible with the flood hazard.

The Wollongong City Flood Study constitutes the first stage of the Floodplain Risk Management process for the Wollongong City catchment. It has been prepared by consultants WMAwater and the Wollongong City catchment Floodplain Risk Management Committee for Wollongong City Council.

EXECUTIVE SUMMARY

BACKGROUND

The Wollongong City catchment area includes the suburbs of Wollongong (south of Crown Street), Coniston, and northern Port Kembla, and drains towards Wollongong Golf Course and JJ Kelly Park, ultimately discharging into Port Kembla Inner Harbour via the Gurungaty Waterway and Tom Thumb Lagoon. There have been several recorded instances of flood-producing storms in the catchment, including March 1978, March 1983, December 1990, March 1995, March 2011 and February 2012.

A previous Flood Study of the lower catchment area, including modelling of open channel areas of Wollongong Golf Course and JJ Kelly Park, was undertaken in 1990 by GHD on behalf of the Water Board (Reference 3). The study did not estimate flood behaviour in residential areas of the catchment. The area was also included in a study on the August 1998 storms that affected the greater Wollongong region (Reference 4), which found that rainfalls near the coast at Wollongong City were far less severe than those that fell higher on the Illawarra Escarpment.

The present Flood Study has been commissioned by Wollongong City Council (WCC), with funding assistance administered by the NSW Office of Environment and Heritage (OEH). This study considers flooding in the entire Wollongong City catchment from local storm runoff, as well as backwater flooding from tidal influences in Port Kembla Inner Harbour.

The key objective of this Flood Study is to develop a suitable hydraulic model that can be used as the basis for a Floodplain Risk Management Plan for the study area, which will assist Wollongong City Council to undertake flood-related planning decisions for existing and future developments. Previous hydraulic modelling of the study area was limited in extent, and did not estimate flood levels or flows in residential areas of the catchment.

The primary objectives of the study are:

- to determine the flood behaviour including design flood levels and velocities over the full range of flooding up to and including the PMF from storm runoff in the Wollongong City Catchment and from tidal influences;
- to provide a model that can establish the effects on flood behaviour of future development;
- to assess the sensitivity of flood behaviour to potential climate change effects such as increases in rainfall intensities and sea level rise; and
- to assess the provisional hydraulic categories and undertake mapping of provisional hazard, preliminary emergency response planning classifications, and preliminary flood planning extent areas.

This report details the results and findings of the Flood Study investigations. The key elements include:

- a summary of available historical flood related data;
- establishment and validation of the hydrologic and hydraulic models;
- sensitivity analysis of the model results to variation of input parameters;
- potential implications of climate change projection; and
- the estimation of design flood behaviour for existing catchment conditions.

A glossary of flood related terms is provided in Appendix A.

FLOOD BEHAVIOUR

The drainage characteristics of the catchment have been significantly altered as a result of urbanisation, particularly in the last 50 years. Most sections of creek and open channel have been covered in the course of development of the catchment, in most instances replaced with pipes. Isolated sections of open channel remain in the upper catchment (particularly the northern branch, Figure 2), as well as within the golf course and JJ Kelly Park. Urbanisation has resulted in the following impacts:

- an increase in the proportion of paved area and consequent reduction in rainfall infiltration, with increases in runoff (both in terms of peak flows and volumes);
- the introduction of embankments (road and rail) and other impediments to flow (such as fences) along major drainage paths, creating trapped depressions where temporary ponding of flood waters can occur; and
- an increase in development density within lower lying areas of the catchment where flood issues are more problematic.

COMMUNITY CONSULTATION

In collaboration with WCC, a questionnaire and information sheet were distributed to residents and owners of property within the study area catchment, describing the role of the Flood Study in the floodplain risk management process, and requesting records of historical flooding. A total of 3113 surveys were distributed with reply paid envelopes, and 393 responses were received (a return rate of 13%). Of these, 314 responses related to residential property, 59 related to commercial or industrial property, and 3 related to both residential and non-residential property. The remaining 17 responses did not indicate the type of property.

The flood experiences described in the survey responses generally related to nuisance flooding, such as ponding of stormwater in roadways or gardens, although instances of above floor flooding in both residential and non-residential properties were also reported. December 1990 and March 1995 were the storms with the most reports of above floor inundation of residential property, with 5 instances apiece.

OUTCOMES

The hydrological and hydraulic modelling undertaken for this study has defined flood behaviour for the 5 year, 10 year, 20 year, 50 year and 1% AEP design floods, as well as the Probable Maximum Flood (PMF). The modelling process included a calibration/validation process that

was somewhat limited by the availability of suitable hydrological data. Extensive sensitivity analyses were undertaken to assess the influences of modelling assumptions on key outputs, and the potential impacts of future climate change. Provisional hazard and hydraulic category mapping has been completed for the 1% AEP and PMF events.

Based on the responses to the community consultation process, residents of the Wollongong City catchment are reasonably aware of flood issues in the area, due to a number of moderate flood events in the last 20 years, however, they may not be aware of the risks of a larger flood closer to the magnitude of the 1% AEP event. Based on inspection of the provisional hazard maps, some particularly high risk areas, in terms of risk to property and risk to life, include:

- Swan Street, and the southern parts of Kembla, Evans and Church Streets;
- Springhill Road, particularly between Swan Street and Keira Street;
- Springhill Road, 200 m to 300 m south of Masters Road;
- Trapped depressions along Gladstone Avenue upstream of the railway line, particularly near Osborne Street, Union Street, Robertson Street, and Vale/Grasmere Streets;
- Auburn Street, just south of Swan Street;
- Vacant land at the northern end of Gregory Street; and
- Wollongong Golf Club.

The design flood levels determined in this study report incorporate an envelope of blockage scenarios to give a “worst-case” for blockage, in accordance with Council’s Conduit Blockage Policy.

RECOMMENDATIONS

During the course of the study, some issues were raised that may warrant further investigation in the Floodplain Risk Management Study, including:

- analysis of February 2012 rainfall that produced flooding in the lower catchment, and validation of the TUFLOW model against observed flood marks from that event;
- existing development controls relating to minimum floor levels and other flood planning levels may be unsuitable for overland flow areas in the Wollongong City catchment. The Floodplain Risk Management Study should review freeboard and flood planning level requirements in the catchment, and determine whether alternative development controls for overland flow areas can be implemented.
- more detailed assessment of the risks of “shelter in place” strategies for houses in high hazard flood areas, using detailed floor level survey, for a full range of flood events. Input from the SES regarding Emergency Risk Planning Classifications should be sought to clarify definitions for urban flash flood areas with little effective warning time; and
- clarification of maintenance responsibilities for structures and trash/debris racks, particularly in the vicinity of Springhill Road and in tidal areas where significant silt build-up has been observed.