



Appendix C

Council's Flood Planning Matrix



**Casino Flood Planning
Matrix - URBAN**

FLOOD PLANNING MATRIX

TABLE 1: RESIDENTIAL, COMMERCIAL AND INDUSTRIAL DEVELOPMENT WITHIN AN URBAN AREA

Controls	Development / Building Type	No Hazard	Flood Hazard Category					Additional Constraint ¹
			Rare Low Hazard ²	Low Hazard	High Depth Hazard	High Isolation Hazard	High Floodway Hazard	Rare High Floodway Hazard ²
Land Use Suitability & Fill Level	Existing Lot - New Development (this line not used)	N/A	SF1	SF1	SF1	SF1	///	SF1
	Subdivision	N/A	SF2	SF2	SF2	///	///	///
	Emergency Services Site (Hospitals, etc.)	N/A	SF3a	SF3a	///	///	///	///
	Other Community Service Building (School, etc.)	N/A	SF3b	SF3b	///	///	///	///
Floor Level	New Habitable Building	N/A	FL2c	FL2c	FL2c	FL2c	///	FL2c
	New Commercial or Industrial Building	N/A	FL2a	FL2a	FL2a	FL2a	///	FL2a
	New Emergency Service Building (Hospitals, etc.)	FL3a	FL3a	FL3a	///	///	///	///
	New Other Community Service Building (School, etc.)	FL3b	FL3b	FL3b	///	///	///	///
	New Ancillary Building (eg shed, carport)	N/A	FL1	FL1	FL1	FL1	///	FL1
	Building Extension	N/A	FL4a	FL4a	FL4b	FL4b	///	FL4b
Building Components		N/A	BC1	BC1	BC1	BC1	///	BC1
Structural	Ancillary Building (eg. shed, carport)	N/A	SS1	SS1	SS1	SS1	///	SS2
Soundness	Other Building	N/A	SS1	SS1	SS2	SS2	///	SS3
Flood Effect	Existing Lot - New Development	N/A	FE1	FE2	FE2	FE2	///	FE2
	Subdivision	N/A	FE2	FE2	FE2	///	///	FE3
	New Ancillary Building (eg shed, carport)	N/A	FE1	FE2	FE2	FE2	///	FE2
	Building Extension	N/A	FE1	FE1	FE2	FE2	///	FE3
	Other Developments (road raising, etc)	N/A	FE1	FE2	FE2	FE2	FE3	FE3
Evacuation & Access	Existing Lot - New Development	N/A	EA1	EA1	EA1	EA1	///	EA1
	Subdivision	N/A	EA3	EA3	EA3	///	///	///
	Emergency Service Site (Hospitals, etc.)	N/A	EA4a	EA4a	///	///	///	///
	Other Community Service Site (Schools, etc.)	N/A	EA4b	EA4b	///	///	///	///
Flood Awareness, etc		N/A	FA2	FA2	FA2	FA2	FA2	FA2

Note 1: In addition to being assigned one of the standard flood hazard categories, a site may be classified as a "Rare High Floodway Hazard". In this instance, the most stringent of the two controls is to be used.

For example, if the site is classified as both "Low Hazard" and "Rare High Floodway Hazard", no community services buildings are permitted (because "unsuitable" is more stringent than SF3b)

Note 2: The extreme flood hazard categories (i.e. "Rare Low Hazard" and "Rare High Floodway Hazard") are applicable only to the 2D model region in Casino

An explanation of the criteria used to define the hazard categories is contained in the Casino Floodplain Management Study (WBM Oceanics Australia, 2001)

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Flood Information Definitions

Casino and Mid Richmond Floodplain Risk Management Plans



Australian Height Datum (AHD)

National survey datum, where 0.0 m AHD is approximately mean sea level.

Design Flood

A calculated flood representing a specific likelihood of occurrence (eg the 1 in 100 year flood has a 1% probability of happening or being exceeded in any year, 50 year/2%, 20year/5%, 500year/0.2%, etc).

It is to be noted that there are floods larger than the adopted standard 100 year design flood.

Floodplain Hazard Category

The potential threat to persons or property due to flood.

The hazard category is used as a tool for assessing the suitability and minimum requirements for land development. The 100 year design flood categories will apply to the majority of LEP zonings (eg residential), while the extreme flood event categories (500 year and PMF) will be used for zonings such as essential services (eg hospital).

The category is based on a combination of velocity (V) and depth (D) at the particular location.

➤ **High Floodway Hazard (HFH)** *based on 100 year design flood.*

Flow paths that carry significant volumes of flood water during a 100 year flood.
Danger to life and limb, evacuation difficult, potential for structural damage, high social disruption, and economic losses. $V > 2\text{m/s}$ or $V \times D > 1$ [for $D > 1\text{m}$] or $D + (0.3 \times V) > 1$ [for $V > 1\text{m/s}$]

➤ **High Depth Hazard (HDH)** *based on 100 year design flood.*

Areas where floodwaters are deep but are not flowing with high velocity.
 $V < 1\text{m/s}$ and $V \times D < 1$ or $D + (0.3 \times V) > 1$

➤ **High Isolation Hazard (HIH)** *based on 100 year design flood.*

As per High Depth but with no easy access to safe refuge (ie more than 500m to high ground).

➤ **Possible High Depth Hazard (HFH) or Low Hazard (LH)** *based on 100 year design flood.*

Insufficient ground level information. Final category dependent on the exact ground levels at the particular site.

➤ **Low Hazard (LH)** *based on 100 year design flood.*

Flood depths and velocities are sufficiently low that people and their possessions can be evacuated. $V < 2\text{m/s}$ and $D + (0.3 \times V) < 1$

➤ **Rare Low Hazard (RLH)** *based on PMF.*

Any land that is inundated in the PMF event and has not been assigned one of the other hazard categories. These areas are generally above the 100 year design flood.

➤ **Rare High Floodway Hazard (RHFH)** *based on 500 year design flood.*

Flow paths that carry significant volumes of flood water during a 500 year design flood.

These areas may or may not be affected by the 100 year design flood.

Danger to life and limb, evacuation difficult, potential for structural damage, high social disruption, and economic losses. $V > 2\text{m/s}$ or $V \times D > 1$ [for $D > 1\text{m}$] or $D + (0.3 \times V) > 1$ [for $V > 1\text{m/s}$]

Freeboard

A factor of safety usually expressed as a height above the flood standard. Freeboard tends to compensate for factors such as wave action, localised hydraulic effects and uncertainties in the design flood levels. **The adopted freeboard for habitable areas is 0.5 metres.**

Habitable Areas

A living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom, or in an industrial or commercial situation, an area used for offices or to store valuable possessions susceptible to flood damage.

Probable Maximum Flood (PMF)

An extreme design flood deemed to statistically be the maximum flood likely to occur.



Richmond Valley Council

Casino & Mid Richmond Flood Studies Casino & Mid Richmond Floodplain Risk Management Studies and Plans

1890's A flood that reportedly "broke across High St and into Casino town". The 1 in 100 year design flood does not reach this level. (Modelling during the Floodplain Management Study of floods greater than the 100 year flood, indicate that part of High St through to the railway line does become a floodway in rarer flood events, eg 1 in 500yr design flood.)

Feb 21st 1954 1954 Flood (peak at 2am) Represents the largest flood experienced in Casino and lower river areas in the 20th Century. The 1954 flood has been estimated as being in the order of a 1 in 70 to 80 year flood for Casino. (State Government guidelines use the 1 in 100 year flood as the benchmark for floodplain planning. The 1 in 100 year flood has a 1% chance of occurring or being exceeded in any year.)

Casino Flood Inundation Map - 1980

Prepared by the NSW Water Resources Commission in 1980. This was Council's source of 100 year design flood information for almost 20 years.

Casino Flood Study - 1997 to 1998, and Mid Richmond Flood Study – 1997 to 2000

WBM Oceanics were commissioned by Casino Council and Richmond River Shire Council, with financial support from the NSW Department of Land and Water Conservation (DLWC) to:

- Carry out an historic flood information survey and site inspections
- Collect additional topographic survey data
- Develop computer models
- Calibrate and verify models to historical floods
- Establish design flood behaviour
- Present the results in a variety of non-technical and technical formats

Casino Floodplain Risk Management Study and Plan – 1998 to 2002

Mid Richmond Floodplain Risk Management Study and Plan – 1998 to 2004

WBM Oceanics were commissioned to carry out the studies and plans. The Floodplain Risk Management Studies draw on the results of the Flood Studies and investigate possible measures to control the flood hazard and reduce flood damages (eg floor level controls, planning requirements, flood mitigation measures, etc).

Property surveys (3,800 properties) were carried out to define the existing floor level, ground levels, and general information regarding size and condition for damages estimates. Properties identified in the flood study and in urban areas as being affected by the Probable Maximum Flood (PMF) were surveyed.

During the course of the floodplain study, the decision was made to develop a detailed two-dimensional (2D) model of the Casino area using the TUFLOW software. (The original 1D model was only able to use topographic level information. The 2D model was able to use the large amount of actual survey information that had been gathered.

The increase in the scale of the models is illustrated by the 1D model using some 500 points for its calculations, and the 2D model using some 85,000 cells over a smaller area for its calculations.)

The Casino Floodplain Risk Management Plan was adopted by Council 21st May 2002, and the Mid Richmond Floodplain Risk Management Plan was adopted by Council 17th February 2004. They have been developed using the State Government Floodplain Development Manual – the management of flood liable land.

**The following information:
for Casino & Mid Richmond
areas is available via
the contacts below**

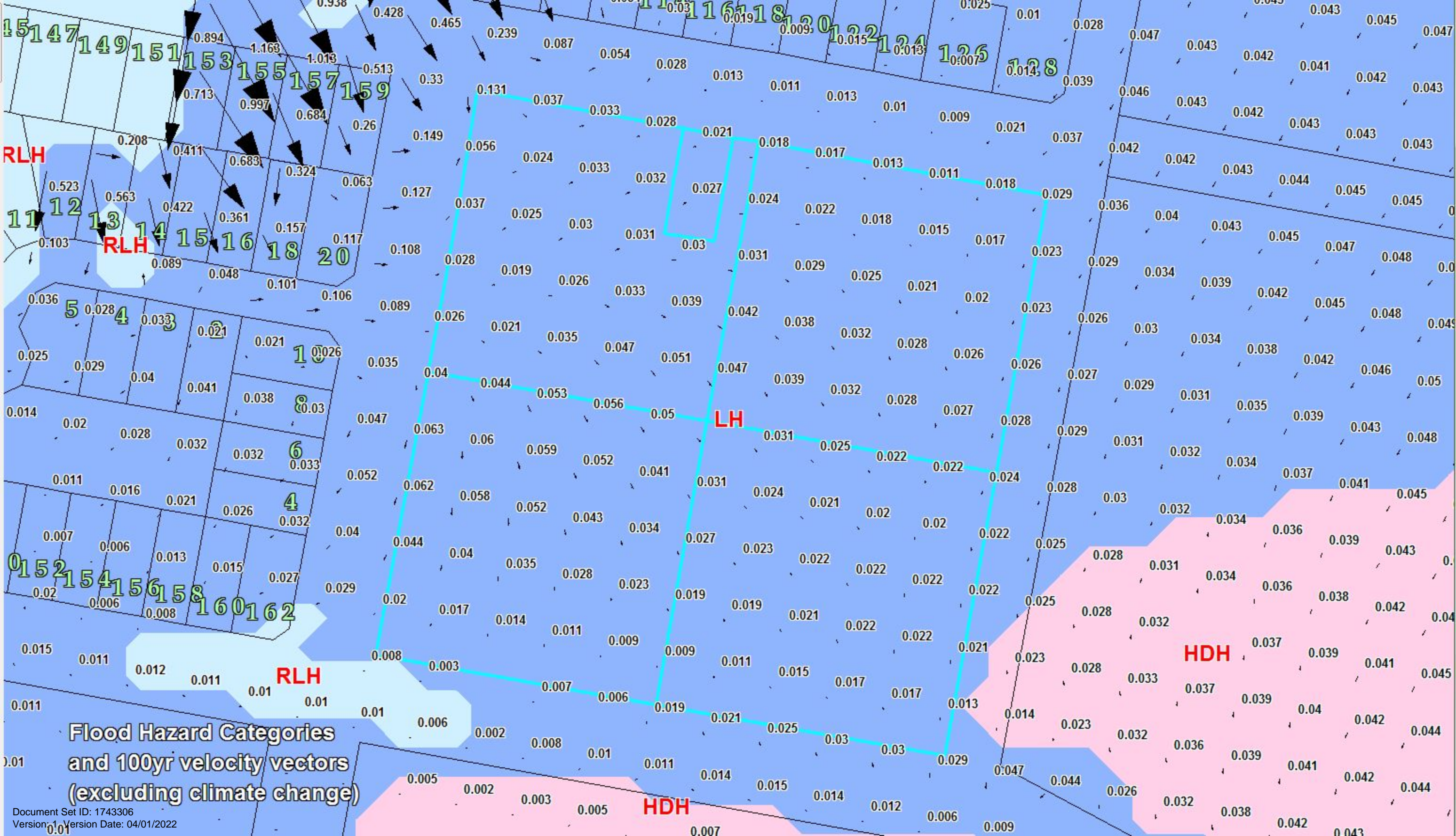
- Minimum Habitable Floor Level (based on 100yr design flood)
- 1 in 100yr Design Flood Level
- Flood Hazard Category (to be used in planning guidelines)
- Existing habitable floor levels of the development on the site
- Existing low and high ground levels on the site
- An information sheet with definitions
- Flood levels and velocities for Q20, Q50, Q100, Q500, and PMF floods

UPDATE: The Richmond River Flood Mapping Study (in conjunction with Richmond River County Council) has been completed with final report issued April 2010 with Base design floods for Q 20, 50, 100, 500, and PMF floods. Two climate change scenarios were run (effectively for 2030 and 2070). Council then considered the climate change issues and adopted a Scenario 3 (CC3) - +900mm sea level rise with a 10% increase in rainfall intensity - for the appropriate long term management of flooding. The Casino model is currently being updated for climate change. The Floodplain Risk Management Plans are also being updated and merged. **Not all information is currently available on Council's website as a new web site one stop shop for flood information is being developed.** It will include technical information, flood levels, floor levels, historic information and photos, development requirements, links to SES, BoM, river gauges, road closures, etc.

www.richmondvalley.nsw.gov.au just type **flood** in the search box,

or Contact Council's Senior Administration Engineer Mr Brian Eggins on 66 600 235
or by email at brian.eggins@richmondvalley.nsw.gov.au

updated 3 July 2012



RLH

RLH

LH

HDH

HDH

Flood Hazard Categories
and 100yr velocity vectors
(excluding climate change)