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Long Term Impact of Flood Affection on Residential Property Prices

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Introduction

Any major town or city located in a river valley can be subject to varying degrees of flooding. In many cases the risk of flooding can be reduced by the construction of flood mitigation works, such as levee banks and spillways. However, despite these works none of these flood prone areas can guarantee that there will not be flood inundation in the future.

In Australia planning authorities have surveyed and mapped all flood prone areas. From these maps they have been able to identify all land that is flood liable as well as an indication of how often such land will be affected by flooding. Flood affectation has been classified into four categories ranging from flood free to possible flood inundation once every 5 years.

This information is available to all participants in the property market and is used as the basis for building approvals, property valuations, property insurance and property finance.

Previous studies by Fibbens (1992), Bialaszewski (1990) and Randell (1997) have determined that property that is either flood affected or on wetlands have a reduced value compared to similar properties without these detriments.

Although the detrimental aspects of flooding are documented in relation to the variation in price based on a flood liable and a flood free property of similar location and characteristics, there has been limited research in the Sydney basin area in relation to the price variation and investment return over an extended time period.

This study has been undertaken to:

- determine the performance of flood effected properties in comparison to similar nearby residential properties that are not flood liable;
- establish if the difference in values between flood liable residential property and flood free residential property is constant, or decreases as the time period from the last known flood increases.

Residential Flood Zones

Sydney, like most cities which have developed in a major river valley, has certain areas that have been built upon despite the fact that are subject to flooding. The relatively small annual rainfall of the Sydney region, combined with an even rainfall distribution and a large network of water storage dams to assist with flood mitigation actually limits the number of floods that occur. In the past twenty years there have been only 26 floods in the Sydney area, with only eight of these floods causing serious residential property damage (Bureau of Meteorology, 1998).

Despite the relative infrequent occurrence flooding in Sydney the damage caused by over floor flooding can be significant both in relation to property damage and service disruption.

To minimise the flood damage to property restrictions have been placed on the type and scope of real estate development that can take place on flood liable land.

Both State and Local Government Authorities have adopted a four type rating system for property within flood prone areas. These classifications are:

1. Very flood liable, possible flooding every 0 to 5 years;
2. Moderately flood liable, with possible flooding every 5 to 20 years;
3. Marginally flood liable, possible flooding every 20 to 100 years;
4. Flood free, outside inundation levels of a 100 year flood.

All the above classifications for property in flood areas are based on the land being covered by rising flood waters. This does not always result in actual flood waters entering or covering the floor of the improvements. Residential building design and land works can increase the actual building floor level height above the various flood level classifications, which can lessen the impact of flooding.

Influence of Flooding on Property

Flood water has been defined as either over land flooding and over floor flooding.

Over land flooding is defined as water covering the actual land, gardens and sheds but not actually entering and covering the floor of the main property (residential, commercial or industrial). Over land flooding can result in some isolation due to restricted vehicular access to the property and in some cases the disruption of services. Some minor infrastructure such as roads, sheds, garages and landscaping can also be damaged but actual property loss is limited.

However, over floor flooding is more severe, with the actual property being inundated with flood water. As well as the problems associated with over land flooding there will be a greater chance of actual property structural damage including wall linings, electrical wiring and in cases where regular flood inundation occurs permanent structural damage of walls and foundations can occur. In addition to the structural damage over floor flooding can also result in the substantial loss of personalty, such as equipment, floorcoverings, furniture and soft furnishings.

As stated by Lambley and Cordery (1991) the property that is subject to over floor flooding can result in the overcapitalisation of the property due to the requirement to restore the property after flooding has occurred. Lambley and Cordery (1991) also considered that not rectifying the damage from flooding may minimise the problem of overcapitalisation but would result in the loss of property value due to the neglected state of the building and overall structural depreciation.

The infrequent nature of flooding in the Sydney basin may have a different influence on residential property values compared to areas where the flooding is more frequent.

One of the major aspects of infrequent flooding is that the actual problems associated with flooding is only apparent during and immediately after a flood. At all other times these problems are not visual and in fact can be a positive factor in relation to property values. The residential property may have severe problems during a period of flooding but offers aesthetic water views and close proximity to water sports at all other times.

In other cases the actual nature of low lying flood prone land in the Sydney area is that certain land can be flood liable and actually not be in close proximity to or in visual contact to the river system that causes the flooding. Despite being advised of potential flooding by the relevant Local Government Authorities during the property search process buyers could discount the impact of flooding when there has been an extended periods of average to lower rainfall and no visible flooding.

According to Fibbens (1992) and Randall (1997) flood prone properties and properties in wet lands are not considered as attractive as other residential property and this results in a lower price or value. On this basis the greatest impact on value or price would be immediately after a severe over floor flood where both disruption and property damage occur.

Identification of Flood Liable Property

Each Local Government Area in New South Wales, which has areas that are liable to flooding produces flood maps that indicate which land is subject to the various classifications of flooding. These maps are available for public inspection.

The flood liability of property is also reported by Local Government Authorities under Section 149 of the Environmental Planning and Assessment Act (1979). As part of the purchase and conveyancing process property buyers obtain a section 149 certificate to determine the allowable uses of the property being purchased. If a property is flood liable, this information will be included in the section 149 certificate.

Therefore, the prudent purchaser is fully aware of the fact that the property being purchased is flood liable and factors this detrimental aspect of the property into the purchase decision.

A properties possible flood liability also has implications in relation to property finance and property insurance.

In Australia it is not possible to ensure a property for flood damage. The effects of flooding and the subsequent restoration costs can not be covered by insurance but must be considered as a long term cost by the purchaser. This disadvantage is limited to some extent by the advance flood warnings that are issued to flood liable property owners.

Lending institutions will not finance properties that are subject to severe flooding. Finance is generally not available to residential properties where the building floor

level is below the 1 in 100 year flood level (subject to over floor flooding) identified by the Local Government Authority.

On this basis the detrimental effects of flood liable property is not only restricted to actual physical and property damage but also reduced financing and insurance opportunities that should also influence value.

Study Area

The study has initially been restricted to a small residential area in the south west suburbs of Sydney. The study covers streets in the suburbs of Canley Vale, Carramar and Lansvale. All these suburbs are in the Local Government Area of Fairfield, which is classified as a lower to middle income socio-economic area. The properties in the study are all residential properties comprising a mix of both single free standing residential houses and low rise multi-residential unit complexes. All flood liable properties are predominantly subject to over land flooding with very few properties actually subject to over floor flooding. On inspection of the study area, it was noted that a majority of free standing single residential dwellings in the flood liable areas had been elevated to lift the habitable floor level of the property above the designated 1 in 100 year flood level. In such cases the flooding would be classified as over land flooding only.

These suburbs are conveniently located with good access to all forms of transport and services, therefore the potential flood liability is the only major limiting property factor for this particular residential market.

All the streets in the study are subject to flooding from the Georges River system.

Research Methodology

After identifying the areas in these three suburbs that were subject to varying degrees of flooding, a physical inspection was carried out to determine the type and level of development in the flood liable areas. As the study is focussing on residential price movement all streets with a significant number of industrial properties were not included in the analysis.

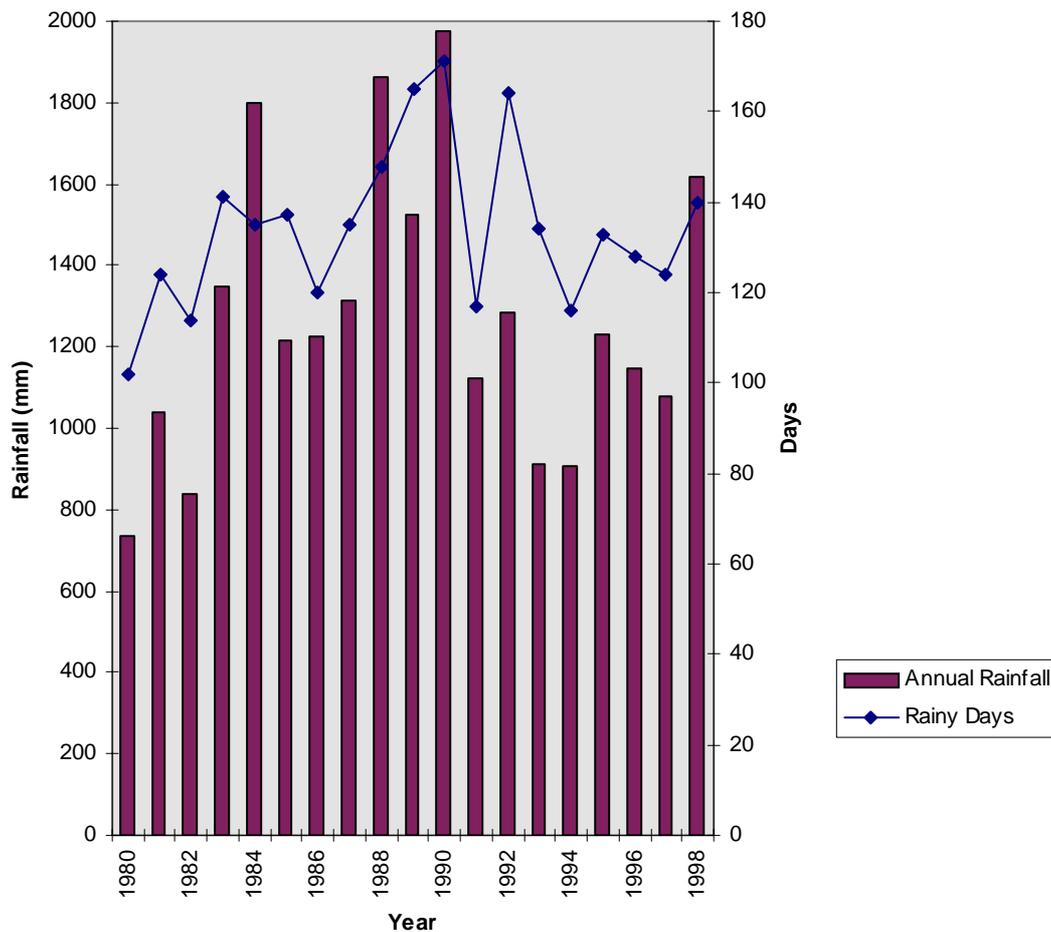
The physical inspection identified 22 streets that were flood liable and predominantly single residential or low rise multi-residential unit complexes. Having identified these 22 streets they were matched with 22 adjoining streets that were just outside the flood liable areas but virtually identical for all other factors that influence residential housing prices. Properties in the flood free streets were also a mix of single free standing residential houses and low rise residential unit complexes.

Having identified the 44 residential streets all residential sales transactions were collected for the period 1984 to 1998 from a commercial electronic data base (R. P. Data Pty Ltd). All sales were sorted on both an annual and a quarterly basis. At this point there is insufficient sales data to carry out a quarterly analysis but this will be carried out when the study areas are expanded.

Total transactions for the study period were 1804 sales, with the majority of sales occurring in the period from 1990 to 1998.

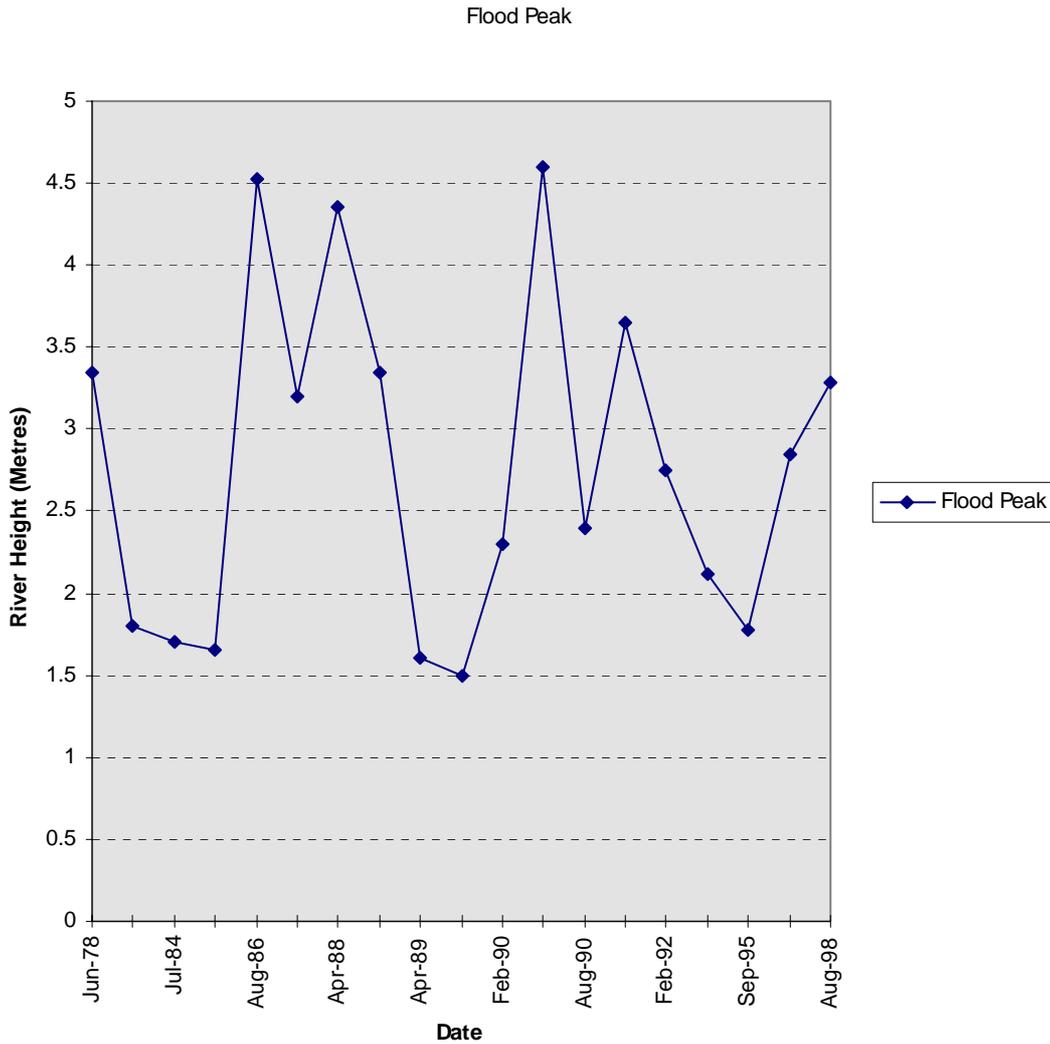
Average annual rainfall figures for Sydney were obtained from the Bureau of Meteorology for the period 1980 to 1998. Although the sales data was not available, for this initial work, for the period prior to 1984 it was considered that the residential prices prior to 1984 could have been influenced by floods prior to this date.

Figure 1. Average Annual Rainfall (mm) and Rainy Days-Sydney (1980-1998)



Data was also obtained from the Bureau of Meteorology- Flood Warning Centre which provided peak river heights for the Georges River for the period 1875 to 1998. From the peak river heights it was possible to determine which river peaks resulted in both over land and over floor flooding. Rainfall and peak river heights are represented in Figures 1 and 2.

Figure 2. Georges River-Peak River Heights (metres)-1978-1998



Sales data was analysed on an annual basis to determine the average annual sale prices for both the flood free and the flood liable properties. These results were compared to determine annual trends, average annual price movements and the average annual return and risk for both the property classifications. These results were then compared to the average annual rainfall and peak river height data to determine any correlation between flood occurrence and sale volume and price movement.

Research Analysis

Over the study period there have been 23 occasions when the Georges River has flooded. These flood peaks have ranged from 1.5 metres to 4.6 metres, as evidenced in Figure 2. However, following discussions with the Hydrology Department of the Bureau of Meteorology, only those flood height peaks greater than 4 metres were considered to be serious over floor floods. All other flood peaks were considered to be over land floods. The highest flood peaks have also coincided with the years of highest annual rainfall (refer to Figure 1). However, high rainfall is not always an accurate indicator of flooding potential.

There is a definite price differential between similar type properties that are flood free compared to the same type of properties that are flood liable. From Table 1 it can be seen that the price differential is not uniform but varies on an annual basis. The greatest price difference between the two groups was in 1991. During the period from April 1989 to June 1991 there were seven occasions when there was flooding on the Georges River in the study area location. Possible over floor flooding occurred on two of these occasions with over land flooding on the other five occasions. However, it appears that the price differential tends to decrease as the occurrence of both over land and over floor flooding decreases.

Table 1 Data Summary 1984-1998

Year	Sales-Flood free	Sales-Flood liable	Average Annual Sale Price-Flood Free (\$)	Average Annual Sale Price-Flood Liable (\$)	Annual Price Difference Flood free-liable
1984	31	18	61100	64800	3700
1985	26	31	69700	70100	1600
1986	29	23	76200	78900	2700
1987	38	32	80900	81300	400
1988	59	54	82000	94800	12800
1989	34	52	103400	117900	14500
1990	29	46	97400	111700	14300
1991	102	88	97900	115400	17500
1992	86	84	105100	118100	13000
1993	102	77	114300	126900	12600
1994	103	86	116100	130700	14600
1995	87	73	117800	127900	10100
1996	75	56	118900	129100	10200
1997	73	58	118500	130000	11500
1998	88	64	123800	135200	11400
Total	962	838			

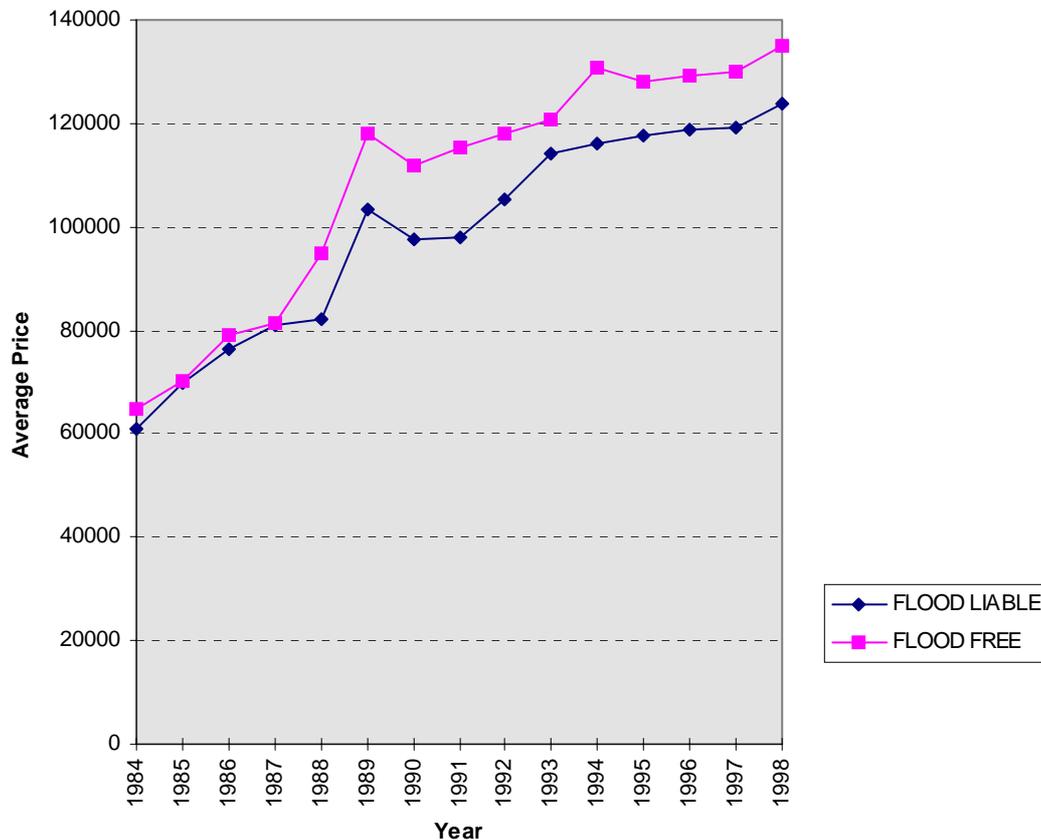
Figure 3 shows the price trend of the flood free and flood liable residential property over the period 1984 to 1998. Basically the price of residential properties in the two areas have followed very similar price trends. Both property types had significant increases in price from the period 1986 to early 1990 with a peak in values in late 1989 followed by a fall in prices in later 1990. This trend followed the general trend for the Sydney property market for the period 1984 to 1990.

Figure 4 also shows that the actual percentage fall in value from 1989 to 1990 were very similar for both property classifications despite the fact that there were also four periods of flooding (one over floor flood) during 1990. Based on this data it appears that a general property recession will have a similar impact over all property classifications.

Following the stock market crash in October 1987 there was a considerable shift of assets from the equity market into the residential property market. During the two years of 1988 and 1989 the price of flood free residential property in the study area

increased from \$81,300 to \$117,900 (45%). At the same time there was also an increase in the price of flood liable residential property but this increase was only 27.8%.

Figure 3 Average Annual Residential Prices (\$) 1984-1998



In relation to annual percentage price movement both flood free and flood liable residential property in the study area had the highest annual increase in 1989, which was followed by the greatest decrease in percentage price movement in the next year (refer to Figure 4).

The actual annual percentage price changes are significantly different, indicating that the detrimental nature of flood liable land is not constant but will vary depending on other economic factors, prevailing weather and flood frequency. The analysis actually shows that there have been years where the price of flood liable land actually increases at a greater rate than the flood free property. Figure 3 shows that this greater increase occurs after a significant drop in prices following a flood period, such as the rapid increase in the price of residential land in 1989 and 1991/92 following the significant floods of 1988 and 1990.

Figure 5 represents the average annual price of residential property as an index based on the price level as at 1984. This index also shows that the changes in the value of flood free and flood liable residential land is not consistent over time and can vary significantly on an annual basis.

Figure 4 Average Annual Residential Price Movement (%) 1984-1998



The average annual return for the two residential classifications are very similar with the flood free land showing an average annual return (nominal) of 5.7 %. The nominal average annual return for flood liabile land is 5.4%. It was expected that the analysis would show a higher return for the flood liabile land due to the added risk to this property type. The risk for both the flood free and flood liabile land is very similar with the flood liabile land showing an overall difference in risk of 0.01%.

Figure 5 Residential Price Index (1984-1998)

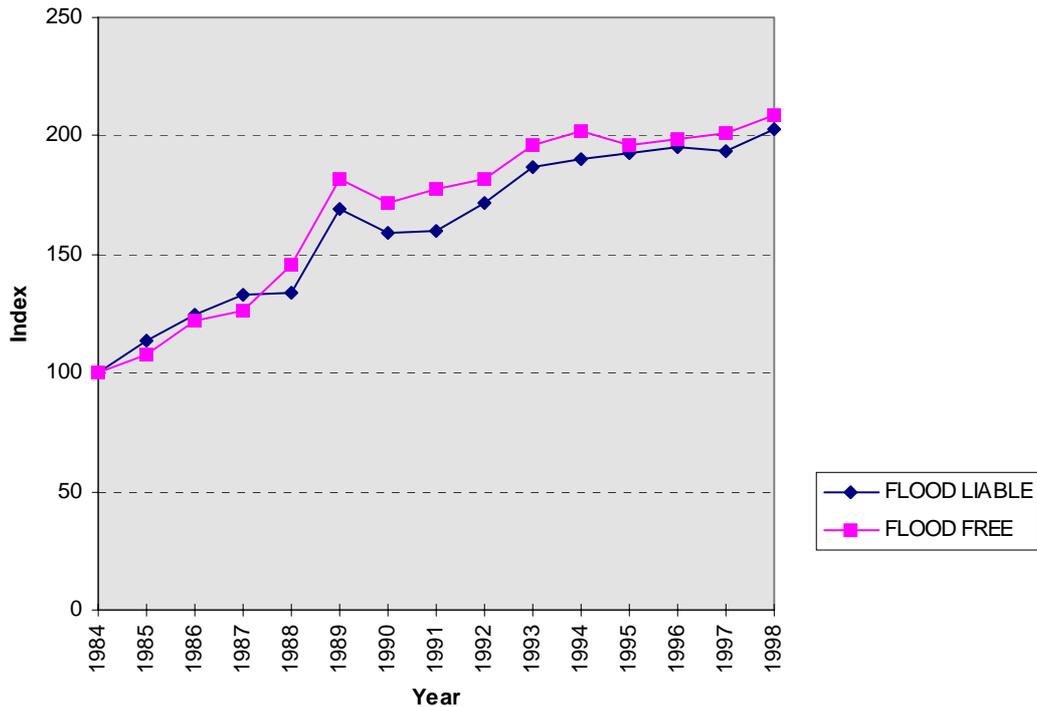


Table 2 Residential Property Returns (1984-1998)

	Flood Free (Study Area)	Flood Liabile (Study Area)	Fairfield LGA
Average Annual Return %	5.7	5.4	
Volatility %	7.77	7.78	

Research Conclusions

This research confirms the results of earlier studies that flood liable property has a lesser value than similar property that is not flood liable. However, this analysis over a 15 year period suggests that the price difference between flood liable and flood free land is not a constant percentage, but varies from year to year. The difference in the price of residential property in a flood free area compared to a flood liable is greatest following a period of over floor flooding and tends to reduce in periods where there has been no recorded flooding or where any flooding is minimal or over land only.

The actual risk of ownership for the two residential property types is very similar and the actual long term average annual return is also very similar. This suggests that once the initial purchase discount is applied to the property the owners of the two properties will receive similar levels of capital appreciation over time. However, the owner of flood liable residential property can suffer short term reductions in capital

appreciation when there is a succession of floods over consecutive years, as demonstrated in the analysis for the period 1988 to 1991.

In periods of very strong property markets, such as the situation in Sydney during 1988, the percentage increases in property prices are very similar for both flood liable and flood free residential property. This suggests that in periods of strong buyer demand and limited supply the market does not consider flood affectation to be a major investment consideration, even if flooding has occurred in that year.

A similar situation exists in relation to periods of property recessions. In 1990, following the property boom of the late 1980s, both flood liable and flood free residential property in the study area suffered a similar overall percentage drop in prices. This suggests that in the case of residential property a major factor influencing the market will have a similar impact on all property in the area and not only effect residential property that is considered to have a some form of detriment. The detrimental factor will have more impact on the subject property in average to good market conditions.

The study also shows that following a period of both decreasing property prices and only small annual increases in property prices the price difference between flood liable and flood free land will decrease, provided there are no further incidences of over floor flooding

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