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Nahas Constructions

Stage 1 Project Application Wolli Creek Proposed Retail Development

Flooding and Drainage Assessment

September 2009

REVISION	STATUS	AUTHOR	CHECKED	APPROVED FOR ISSUE:	ISSUE DATE:
3	For approval	C Randall	C. Avis	C. Avis	24.09.09

TABLE OF AMENDMENTS

Amendment No.	Section Affected	Description of Amendment

**Amendments shown as red in report body*

1.0 INTRODUCTION

Hughes Trueman has been commissioned by Nahas Constructions to undertake a flooding and drainage assessment to support the proposed re-development of 78-96 Arncliffe St, Arncliffe.

The subject site is situated within the municipality of Rockdale and is bound by Arncliffe St to the north, Brodie Spark Drive to the east, Princes Highway to the south and commercial areas to the west. The existing site is occupied by a number of buildings and open pavement area. While the proposed development includes refurbishment of the main building, demolition of numerous other buildings and reconstruction of the carpark to suit the new layout.

The aim of this report is to discuss stormwater and flooding issues related to the subject site and demonstrate how the proposed design meets the relevant statutory requirements. In particular, the following items are discussed:

- Understand the existing flooding conditions for the Wolli Creek area and determine flooding issues on the subject site;
- Identify flooding requirements from regulatory authorities;
- Discuss the implementation of flooding and drainage requirements into design and make an assessment on whether impacts are positive, negative or negligible.

2.0 EXISTING FLOODING ISSUES

The subject site is located within the "Wolli Creek" development area and is situated approximately 300m from the Wolli Creek watercourse (to the north) and approximately 50m from the Cooks River watercourse (to the east).

Rockdale City Council has indicated that due to the close proximity to these creeks (and the low lying nature of the local terrain) the subject site is considered to be flood affected and consequently requires the development of a flood management plan.

We understand from Rockdale City Council (letter dated 6th July 2009) that the subject site is exposed to "Mainstream Flooding: Flood Storage: Low Hazard". That is, Flooding within this catchment area results from intense rainfall over a period of 1-3 hours across the catchment. Runoff concentrates in the creek system, which eventually overtops its banks and spread across the floodplain. Flooding is generally of a short duration (2-4hrs) (Rockdale City Local Flood Plan, April 2009).

We also understand that the majority of floods within the Rockdale City Council area come from flash flooding along the Cooks River and its tributaries; and localised flash flooding independent of flooding on this stream can also inundate properties. Since the 1970's there have been several cases of property damage being caused by surface flooding and stormwater runoff entering premises.

We also understand that flooding issues both (a) on site; and (b) in the local area, are not dictated by on site drainage issues but instead from these flash flooding and mainstream flooding items (i.e. on a catchment wide level).

Figures C-1 and C-2 in Appendix C shows the extent of flood inundation on the existing and proposed layout.

Figure C-1 illustrates the extent of flood inundation across the existing site. Here the flood depth (to 2.55m AHD 0.5% AEP) ranges from 0 to 0.49m across the site. There is a localized sag point in the centre of the site where a clear overland flowpath is not provided. Similarly the configuration of the buildings on the Arncliffe St frontage do not allow floodwaters to exit the subject site towards the north-west. Due to the nature of mainstream flooding, there is little to no velocity.

The majority of existing buildings on the subject site have floor levels below the minimum level specified by Rockdale City Council (3.05m AHD) , these range from 2.25m-2.99m with the only existing floor levels above the level being situated at the corner of Arncliffe St and Brodie Sparks Drive.

3.0 FLOODING REQUIREMENTS

3.1 Council Requirements

Rockdale City Council have specified (letter dated 6th July 2009) the following minimum flooding requirements on the subject site (Refer to Appendix A for council's letter):

- 0.5% AEP Flood Level = 2.55m Australian Height Datum (AHD);
- Minimum Flood Planning Level = 3.05m AHD;
- Probable Maximum Flood Level = 5.11m AHD;
- Minimum Garage Floor Level = 2.55m;
- Site is considered Mainstream Flooding: Flood Storage: Low Hazard.
- Habitable floor levels shall be designed to 0.5m above the 0.5% AEP flood level.

Rockdale City Council's latest policy relating to stormwater issues in the local area is the *Stormwater Management DCP 78 (May, 2007).* The following comments are made:

- Specific requirements for the Wolli Creek Redevelopment area are specified in Section 2.7.
  - Oil separator required for runoff from parking areas and driveways;
  - On site retention or detention is not required;
  - Internal pipe system to convey 20yr flows with 100yr flows carried as overland flow with a minimum of 200mm freeboard to habitable floor levels;
  - Pipe connection to council system shall have 20yr capacity with provision for safe overflow to the street for flows in excess of the 20yr ARI flow.

  The stormwater management principles incorporated on the proposed redevelopment has incorporated these items. In particular, the minor pipe system is provided to discharge 20yr flows offsite while the minimum 200mm freeboard is achieved by incorporating the levels recommended in Rockdale City Council's letter mentioned above. There is also a proposed oil separator within the landscaping area adjacent to Princes Highway to satisfy Section 7.6
- We recognize that on-site absorption is council's preferred option for stormwater discharge (Section 4.1), however there is a basement level carpark proposed in future stages of the development. Consequently it is considered more appropriate to connect to Council's existing stormwater system via connections to stormwater pits in adjacent streets as per Section 4.1.3.
- Roof systems will be designed in detailed design stage in accordance with Section 4.4. Connection shall be made to the nearest site stormwater pipe.
- Overland flowpaths have been incorporated upon the proposed layout to allow surface runoff to exit the subject site in accordance with Section 4.7.3. Here flowpaths are provided to both Arncliffe St and Princes Highway.

- Trench grates are provided at each of the driveway entry/exits as per Section 4.10 and shall be bolted down. Carpark grades satisfy the 1% minimum slope.

Rockdale City Council's *Stormwater Management DCP 78 (May, 2007)* also makes reference to another policy titled *DCP 66 Management of Flood Risk,* however at the time this study was prepared it was not available on council's website (appears to have been removed).

3.2 Freeboard to Floor Levels, etc

In accordance with the proposed floor level constraints, the proposed development has incorporated the following (also refer to sketch DAC120):

- Proposed floor level on site at 3.05m AHD;
- Proposed Loading dock at 4.00m AHD;

3.3 Maximum Ponding Depth

In accordance with standard engineering principles, a maximum ponding depth has also been incorporated within the proposed carpark areas. Here the lowest carpark level is 2.25m AHD, which is 0.3m below the 0.5% AEP Flood Level specified by Rockdale City Council. Whilst no specific design requirement exists for maximum ponding depth in a 0.5% AEP storm event, it is generally accepted that a safe ponding depth in a 1% AEP storm event is 200mm. We have therefore made what is, in our opinion a practical assumption of a limit of 300mm ponding for the 0.5% AEP event.

3.4 Flood Safety & Evacuation

We understand from discussions with Mr Tony Merrilees of Rockdale Council that due to the mainstream and flash flooding issues surrounding the subject site, council's primary concern is the implementation of safe freeboard for floor levels to flood levels and flood safety and evacuation procedures. To address these concerns, a "Flood Management Plan" is subsequently provided in Appendix B.

The Flood Management Plan incorporates (a) relevant sections of the SES Plan; along with (b) site specific recovery procedures, in order to present a "stand alone" document which can be kept on the premises and incorporated for the entire life of the building.

This policy can then be passed from owner to owner and updated at regular intervals to maintain coordination with relevant SES guidelines.

Here site specific response and recovery procedures are specified for times of flash flooding where SES may not have initiated instructions to ensure the increased protection of both staff and customers.

In particular, this report demonstrates:

- Time when vertical evacuation provisions are required;
- Procedures for managing and communicating with both staff and customers;

3.5 Potential Effects of Climate Change

Global warming and climate change refer to an increase in average global temperatures. Here natural events and human activities are believed to be contributing to an increase in average global temperatures. This is caused primarily by increases in "greenhouse" gases such as Carbon Dioxide (CO_2). *The earth has warmed, on average, by about 0.7 °C since 1910 with nine of the ten warmest years on record occurring in the past decade. There has been an increase in heatwaves, fewer frosts, and a warming of the lower atmosphere and raises in ocean levels. Australian temperatures have increased by almost 0.9 °C over the last hundred years, which is slightly more than the global average. (CSIRO website, 2009).*

The outlet of Cooks River discharges to Botany Bay (and then onto the Tasman Sea) approximately 3km to the east of the subject site. Due to the close proximity to the eastern coastline, in accordance with the NSW Floodplain Development Manual (2005) the flood risk at the site is also assessed against the potential effects of climate change, sea level rise and an increase in rainfall intensity.

In 2007, the Department of Environment and Climate Change (DECC) provided a guideline entitled "Practical Consideration of Climate Change" to demonstrate how to consider the impacts and ramifications of potential climate changes and sea level rises in coastal areas.

The DECC guidelines suggests that the following be considered for rises in ocean level up to the year 2100:

- Low level ocean rise = 0.18m;
- Medium level ocean rise = 0.55m;
- High level ocean rise = 0.91m.

Recent king tide levels in Sydney (12th January 2009) reached a peak RL of **1.96m**. By applying the recommended values for potential ocean level rises, results indicate that the minimum floor level of 3.05m AHD remains above these levels (2.14m, 2.51m and 2.87m AHD).

Safe / improved overland flowpaths are provided on site and evacuation measures in place if this rare event did ever occur.

4.0 PROPOSED DEVELOPMENT

4.1 Description of the Proposal

This application relates to Stage 1 of the proposed re-development of 78-96 Arncliffe St, Arncliffe (refer to *Drawing C120 - Siteworks and Stormwater Management Plan)*. Here stage 1 works includes the following:

- Refurbishment of the main building in order to create a new supermarket and bottleshop;
- Demolition of numerous other existing buildings;
- Reconstruction of the carpark to suit 197 car spaces;
- New entry / exit driveway to Arncliffe St;
- Relocation of existing Princes Highway entry / exit driveway to the south;
- Loading dock to Brodie Spark Drive.

Future stages will likely incorporate further re-development including an underground carparking area.

Proposed drainage works are also discussed in Section 3.0.

4.2 Assessment of flooding and drainage

As discussed in Section 2.0, it is understand that flooding issues both (a) on site; and (b) in the local area, are not dictated by on site drainage issues but instead from flash flooding and mainstream flooding items (i.e. on a catchment wide level). **That is, proposed re-development works on the subject site will have a negligible effect on the overall flooding of the area.** Subsequently the design requirements for the subject site are instead aimed at minimizing risks associated with both property and life.

The flooding and drainage assessment undertaken by Hughes Trueman subsequently included implementation of the flooding requirements discussed in Section 3.0 within a stormwater concept plan. Refer to drawing C120 – Siteworks and Stormwater Management Plan.

Assessment of the proposed re-development indicates that the subject site is typically improved from the existing scenario. In particular the following benefits are noted:

- **Improved overland flowpaths** - overland flowpaths are now provided to both Arncliffe St and Princes Highway above the minimum 1% grade. There is no longer a sag point in the middle of the site.
- **Improved floor levels** – The majority of existing buildings on the subject site have floor levels below the minimum level specified by RCC (3.05m AHD) , these included 2.25m, 2.32m, 2.54m, 2.55m, 2.76m, 2.82m and 2.99m (refer figure C-1). The proposed re-development has incorporated the minimum floor level set by the 0.5% AEP which will reduce risks associated with property damage and life.

- **Improved Quality** – Oil separator from carpark areas will improve the quality of runoff exiting the site. Raingardens are also provided within the islands for water sensitive urban design for treatment of low flows.
- **Improved Safety** – In addition to the raised floor level, the maximum ponding of 300mm within carpark areas (for the 0.5% AEP event) will also improve the safety of patrons. Similarly the implementation of the evacuation plan will improve the on-site emergency response measures.

5.0 CONCLUSION

The subject site is situated within the municipality of Rockdale and is bound by Arncliffe St to the north, Brodie Spark Drive to the east, Princes Highway to the south and commercial areas to the west. The existing site is occupied by a number of buildings and open pavement area. While the proposed development includes refurbishment of the main building in order to create a new supermarket and bottleshop, demolition of numerous other existing buildings, reconstruction of the carpark to suit 197 car spaces, new entry / exit driveway to Arncliffe St, relocation of existing Princes Highway entry / exit driveway to the south and loading dock to Brodie Spark Drive.

The subject site is located within the "Wolli Creek" development area and is situated approximately 300m from the Wolli Creek watercourse (to the north) and approximately 50m from the Cooks River watercourse (to the east). Rockdale City Council has indicated that due to the close proximity to these creeks (and the low lying nature of the local terrain) the subject site is considered to be flood affected and consequently requires the development of a flood management plan.

Rockdale City Council have advised that "*Mainstream Flooding: Flood Storage: Low Hazard"* affects the subject site where runoff concentrates in the creek system, which eventually overtops its banks and spread across the floodplain. Localized *flash flooding* – which is independent of mainstream flooding - also affects properties within the Rockdale Area.

Due to the close proximity to the eastern coastline, the flood risk at the site was also assessed against the potential effects of climate change, sea level rise and an increase in rainfall intensity. Assessment indicates that the minimum floor level of 3.05m AHD remains above the regulatory guidelines for low, medium and high level rises in ocean levels up to the year 2100. Safe / improved overland flowpaths are provided on site and evacuation measures in place if this rare event did ever occur.

The proposed development has taken into account the following flooding requirements:

- Specific requirements for the Wolli Creek area as specified within Section 2.7 of Rockdale City Council's DCP 78. Items included in the design include bolted down trench grates, clear overland flowpaths, oil seperator, piped discharge to pit in street system, internal piped systems, no detention and the like;

- Raingardens are provided as part of the Water Sensitive Urban Design approach and will provide treatment of minor flows for the removal of nutrients and other pollutants prior to discharge from site.
- Minimum freeboard from proposed finished floor levels to flood levels as specified in a letter by Rockdale City Council;
- Limiting surface ponding in the proposed carpark to an acceptable level. In our opinion a practical assumption of a limit of 300mm ponding for the 0.5% AEP event has been applied;
- Provided guidelines on safety and evacuation measures in case of severe localized flash flooding.

It is our understanding that flooding issues both (a) on site; and (b) in the local area, are not dictated by on site drainage issues but instead from flash flooding and mainstream flooding items (i.e. on a catchment wide level). Consequently the proposed redevelopment is considered to have a negligible effect on the overall flooding of the area. By incorporating the above mentioned protective measures (for both property and life), we are therefore of the opinion that the relevant flooding issues on site have been adequately addressed.

Assessment of solely the proposed re-development indicates that the subject site is typically improved from the existing scenario. In particular, improvements are achieved on overland flowpaths, floor levels, quality of runoff exiting site and safety measures.

APPENDIX A – Council Correspondence

6 July 2009

ROCKDALE CITY COUNCIL
On Historic Botany Bay

Our Ref: F08/691
Contact: Tony Merrilees

Mr Christopher Avis
Hughes Trueman
P.O. Box 163
PARRAMATTA NSW 2219

Dear Mr Avis

Flood Advice Letter for 78 Arncliffe Street Wolli Creek and Adjoining Properties

When lodging a Development Application you must enclose a copy of this letter.

I refer to your letter received 6 July 2009 requesting flooding information for the above property. Council has notated this property as being affected by the 1% Annual Exceedance Probability (A.E.P.) flood. The 1% AEP flood means there is a 1% chance of a flood of this height, or higher occurring in a period of one (1) year.

This property lies in the Wolli Creek Development Area and Council has determined that the 0.5% AEP flood shall be the design standard in this case. Council commissioned a study by consultants Webb McKeown & Associates which indicates a 0.5% A.E.P. flood level at the subject site of 2.55 m above Australian Height Datum (A.H.D.), where zero metres A.H.D. is approximately mean sea level. The Flood Planning Level for this site is 3.05 m A.H.D. The Probable Maximum Flood (PMF) is estimated to be 5.11m AHD. Council has no information regarding tsunamis in the Rockdale Council area.

Council considers that this is the best currently available information on flooding at the site, but Council cannot comment on the accuracy of the result. In order to relate this flood level to your property you will need to obtain survey to determine the existing ground and floor levels to A.H.D. at this site.

The Flood Risk Exposure of the site varies and has been assessed as:
- Mainstream Flooding : Flood Storage : Low Hazard

For the design of new developments on this land the minimum habitable floor level will be 3.05 m A.H.D. The minimum on grade garage floor level will be 2.55 m A.H.D. Where below ground garages are proposed they are to be floodproofed to the habitable floor level. Flow through open form fencing is required for all perimeter fencing up to the 0.5 % A.E.P. Flood Level. Air conditioning units, electrical connections to hot water tanks and other items that may be damaged by flood waters are to be set above the minimum habitable floor level.

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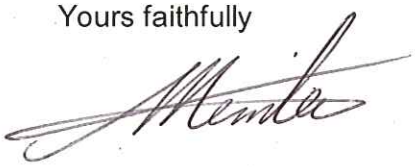
All services entering the building are to be floodproofed to the PMF level.

A Flood Management Plan is required which will demonstrate when vertical evacuation provisions are required and if so how they will be managed and communicated to occupants. In this situation occupants need to escape to a safe level above the PMF level plus 0.5 m. The plan is also to detail how the flood awareness of owners, residents or occupants who change through time can be preserved.

Should you require any further information, please contact me on 9562 1652.

Yours faithfully



Tony Merrilees
Floodplain and Stormwater Engineer