

ANNEXURE 7

Flood Compliance Report

prepared by

WMAwater Pty Ltd

Cowman Stoddart Pty Ltd

PO Box 738

NOWRA

NSW 2541

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3 May 2017

Attention: Mr. S Richardson

Dear Steve,

**Re: DCP2014 Chapter G9:Flood Compliance Report for Proposed Modification
Application to MP06-0228, Shoalhaven Starches Expansion Project, Bolong Road,
Modification to Boiler No 2, 4 and 6**

This letter has been prepared by R W Dewar BSc, MEngSci, MIEAust CPEng Member No 477618 who has over 30 years of experience in NSW in floodplain management.

1 Introduction

Shoalhaven Starches intend to undertake the following works located at their Bomaderry plant to reduce their energy costs. The proposal involves:

- Conversion of Boiler No 2 from the use of woodchips back to coal fired. Associated with this are external additions to the Boiler No 2 building. In part these additions will replace existing structures but there will be a slight increase in building footprint (refer Appendix A and below);
- Conversion of Boiler No 4 from gas to coal fired;
- Construction of a new baghouse and associated ducting adjacent to Boiler No 6.

The location of the proposed works on GoogleMaps aerial photograph is shown below in red.



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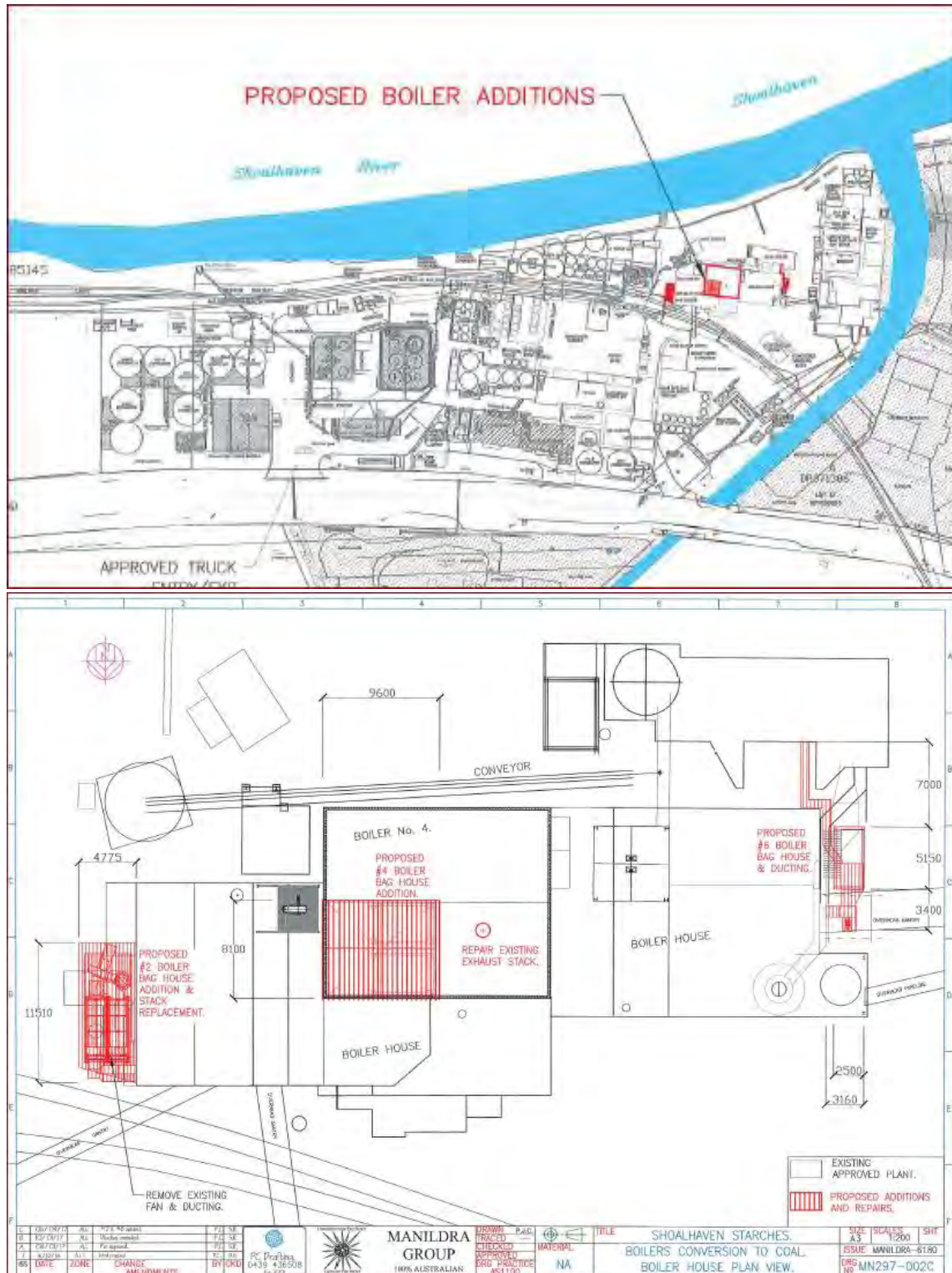
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Design plans of the proposed works are provided below and in Appendix A.



The site is inundated in the 1% Annual Exceedance Probability (AEP) flood event by floodwaters from the Shoalhaven River and this letter provides an assessment of the implications of this proposal on flood levels, flows and velocities.

WMAwater (formerly known as Webb McKeown & Associates) undertook the 1990 Shoalhaven River Flood Study and subsequent 2008 Floodplain Risk Management Study and Plan. We have also undertaken many similar type flood assessments for Shoalhaven Starches in the past and are therefore very familiar with flooding in the Shoalhaven River floodplain and the implications for flooding of further development within the confines of the existing Shoalhaven Starches plant on Bolong Road.

2 Description of Proposal

The proposal is to construct plant as described in Appendix A. An indicative ground level at the site is 4.2 mAHD and the 1% AEP flood level is approximately 5.5 mAHD according to the Flood Certificate obtained on 2nd May 2017 (attached as Appendix B).

3 Council Flood Certificate

Council's flood certificate (Appendix B) advises that the site is inundated in the 1% AEP event and is described as High Hazard and Floodway. The projected sea level rise estimates due to climate change will increase the 1% AEP flood level at this site by up to 0.1m.

4 Compliance with Chapter G9: Development on Flood Prone Land (DCP2014)

The following sections describe compliance with Chapter G9: Development on Flood Prone Land (DCP2014 Amended 1st July 2015). As the works will not involve fill, or subdivision of lands and only a small amount of excavation piling, compliance with these performance criteria have not been addressed.

4.1 Performance Criteria - General (Section 5.1 of DCP only)

PERFORMANCE CRITERIA	RESPONSE
P1 Development or work on flood prone land will meet the following:	
The development will not increase the risk to life or safety of persons during a flood event on the development site and adjoining land.	The works are such that their construction will not increase the number of workers on the site or provide an additional threat to the safety of any worker during a flood.
The development or work will not unduly restrict the flow behaviour of floodwaters.	Refer Hydraulic Impact Assessment below.
The development or work will not unduly increase the level or flow of floodwaters or stormwater runoff on land in the vicinity. The development or work will not exacerbate the adverse consequences of floodwaters flowing on the land with regard to erosion, siltation and destruction of vegetation.	The works are within existing built up industrial land clear of vegetation. Due to there being no significant increase in footprint and all runoff under existing and future conditions reaching the ground in nearly identical locations, the works will have no impact on erosion or siltation.
The structural characteristics of any building or work that are the subject of the application are capable of	A separate structural report will be provided.

PERFORMANCE CRITERIA	RESPONSE
withstanding flooding in accordance with the requirements of the Council.	
The development will not become unsafe during floods or result in moving debris that potentially threatens the safety of people or the integrity of structures.	A separate structural report will be provided.
Potential damage due to inundation of proposed buildings and structures is minimised.	The works are largely sealed structures with many parts of the works above the PMF flood level which means there will be minimal damage due to inundation, unless the structure itself fails. There will potentially be some damage to electrical and other components feeding the equipment and these are considered in Shoalhaven Starches Flood Plan.
The development will not obstruct escape routes for both people and stock in the event of a flood.	The works will not occupy escape routes or cause workers to become trapped.
The development will not unduly increase dependency on emergency services.	The works are such that their construction will not increase the number of workers on the site or provide an additional threat to the safety of any worker during a flood.
Interaction of flooding from all possible sources has been taken into account in assessing the proposed development against risks to life and property resulting from any adverse hydraulic impacts.	Refer Hydraulic Impact Assessment below.
The development will not adversely affect the integrity of floodplains and floodways, including riparian vegetation, fluvial geomorphologic environmental processes and water quality.	The works will be constructed on land designated as high hazard floodway in the 1% AEP event. The site is industrial land with nil existing vegetation and is beyond the influence of normal fluvial geomorphic processes. The works will have no impact on water quality.

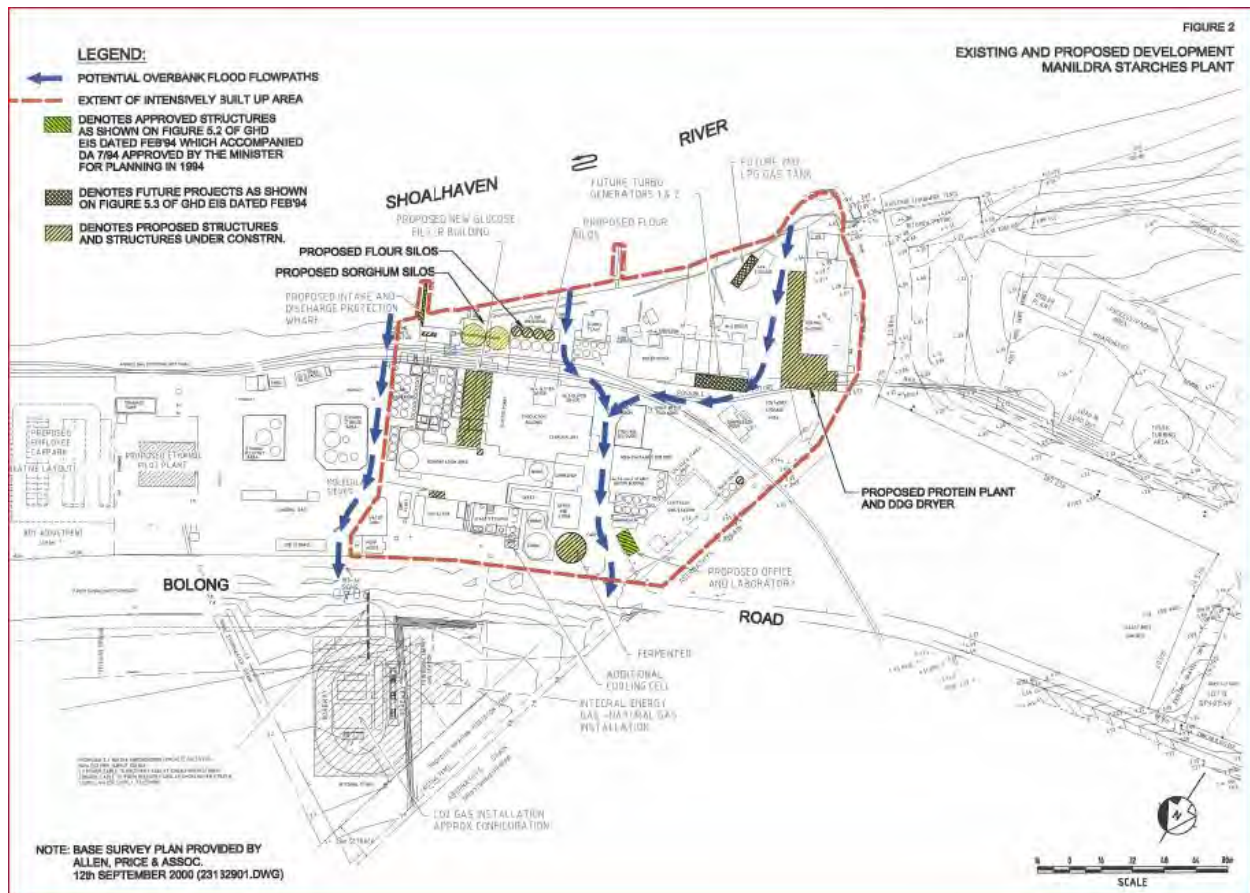
4.2 Hydraulic Impact Assessment - Works within the Existing Shoalhaven Starches Plant Area

The aerial image above from GoogleMaps indicates that the position of the proposed works on the boilers is surrounded by an extensive array of existing plant and buildings. Thus the flow path of floodwaters from the Shoalhaven River over the river bank and towards Bolong Road and through the plant is already significantly impeded.

The construction of any works on the floodplain will cause a loss of temporary floodplain storage and a loss of hydraulic conveyance. The resulting increase in flood levels will depend upon the

magnitude of these losses. Given that not all the proposed works are on the ground (i.e are above the 1% AEP flood level or even the PMF) and the floodplain storage area of the Shoalhaven River floodplain is of the order of 100km² the loss of temporary floodplain storage due to the proposed works is too small to be evaluated.

The loss of hydraulic conveyance depends on the extent of the restriction to a flowpath caused by the works. Prior to construction of the Shoalhaven Starches plant at Bomaderry there would have been significant flow through the site during a flood, as there is across any river bank. However, since approximately 1960 the ongoing construction of the plant has effectively blocked the flow path through the site. This issue has been investigated in our October 2000 report titled "*Further Development within the Manildra starches Plant off Bolong Road, Bomaderry - Hydraulic Assessment*". The conclusions from that report are provided in Appendix C. In summary an agreement was reached that any future development within the intensively built-up area, as indicated on the Figure 2 below (taken from that report) would not require hydraulic modelling to quantify the hydraulic impacts and cumulative effects.

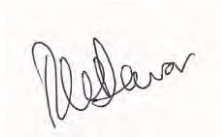


Since publication of that report in 2000 a TUFLOW 2 dimensional hydraulic model has been established by Shoalhaven Starches in order to assess the hydraulic impact of any future works. This model is much more detailed than the CELLS model available in 2000, however the proposed development and surrounding existing plant is still considered too complex to be accurately assessed using the TUFLOW hydraulic model. One of the main issues is that large parts of the plant are on piers and there are a multitude of pipes which makes it impossible to accurately reflect each of these structures using the TUFLOW model.

In conclusion WMAwater consider that there would be no significant increase in the 1% AEP flood level as a result of the proposed works within the existing Shoalhaven Starches plant area.

Should you have any questions or require further clarification regarding the above do not hesitate to contact the undersigned.

Yours Sincerely,
WMAwater

A handwritten signature in black ink, appearing to read "R W Dewar", written on a light-colored rectangular background.

R W Dewar
Director



EXISTING

— BLACK

PROPOSED ADDITIONS
AND REPAIRS.

— RED

PROPOSED BOILER ADDITIONS



Shoalhaven

Shoalhaven

IP-305145

SALING ROAD

APPROVED TRUCK
ENTRY/EXIT

141
IP (06/5759)

440000 1000



MANILDRA
GROUP

Commitment to Excellence

DRAWN P.C.
CHECKED
APPROVED
PRO. PRACTICE
651100

TITLE
SHOALHAVEN STARCHES, NOWRA.
BOILERS CONVERSION TO COAL
OVERALL SITE PLAN.

SIZE
SCALE
A3
1:2000
MANILDRA-6180
DRC: MN297-001C

DATE	ZONE	CHANGE	APPROVED/REVIEW	DATE
1	20/09/17	ALL	2/2/17 by site address	P.C.
2	02/12/17	ALL	Revised	P.C.
3	20/12/17	ALL	Revised	P.C.
4	16/02/18	ALL	for approval	P.C.
5	16/02/18	ALL	for approval	P.C.

EXISTING
APPROVED PLANT

PROPOSED ADDITIONS
AND REPAIRS

23.00m

STACK

REPAIR EXISTING
EXHAUST STACK

42.00m

25.00m

FLOUR UNLOADER

PROPOSED #4
BAG HOUSE
ADDITION

A FLOUR MILL

25.35 MOOF TOTT

STACK

21.60m

STACK

SWITCH
FACILITY

DRYER

PACKER

PROPOSED #4
BAG HOUSE
ADDITION & DUCTING

15.00

15200

.317 T.O. SLAB

G.L. 00.00

WESTERN ELEVATION



MANILDRA
GROUP
100% AUSTRALIAN

DRAWN
CHECKED
APPROVED
DATE
AS 11/00

NA

TITLE
BOILERS CONVERSION TO COAL
BOILER HOUSE WESTERN ELEVATION

SIZE
A3
SCALE
1:250
SHEET
MANILDRA-6180
NO. MN297-005C



COUNCIL REFERENCE: 28112E (D17/131933)
 CONTACT PERSON: Kate Britton
 DATE: 2 May 2017

Stephen Richardson
 PO BOX 738
 Nowra NSW 2541

Thank you for your recent inquiry in relation to flood data held by Shoalhaven City Council.

Please find below the original details of your inquiry, some general information on flooding as well as the requested property specific Flood Certificate.

Details of Inquiry:

Name of Inquirer	Stephen Richardson	Date Requested: 16 Apr 2017
Reason for Enquiry	New Construction	
Contact Details	Phone: 02 4423 6198 Email: steve@cowmanstoddart.com.au Postal: PO BOX 738 Nowra	
Preferred Response	Email	
Notes		
Survey Detail	Not Provided	
Flood Safety Tip	Causeways can kill! Never drive through flood waters! Wait and be safe!	
General Flood Information	Shoalhaven City Council in conjunction with SES has produced site specific flood brochures for Shoalhaven Heads, Nowra / Bomaderry / Terara, Greenwell Point/Orient Point and Sussex Inlet. General Flood Information booklets, such as "What to do before, during & after a flood" prepared by Emergency Management Australia are also available. You can pick up free copies of all brochures at the City Administration Building in Nowra.	

FLOOD CERTIFICATE

According to the *Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011)* this property: Bolong Rd, BOMADERRY - Lot B DP 376494; Bolong Rd, BOMADERRY - Lot B DP 334511; and 160 Bolong Rd, BOMADERRY - Lot 1 DP 838753, is affected by the 1% AEP flood event. This flood certificate only relates to a small area of the 3 three lots, as indicated on the image below.



FLOOD INFORMATION

Year	Existing	Projected 2050	Projected 2100
Flood Planning Level	Not applicable	6.1m AHD	6.1m AHD

Hazard Category	High	High	High
Hydraulic Category	Floodway	Floodway	Floodway

Probable Maximum Flood Level	7.8m AHD	7.8m AHD	7.8m AHD
1% AEP Flood Level	5.5m AHD	5.5m AHD	5.5m AHD
2% AEP Flood Level	5.1m AHD	5.1m AHD	5.1m AHD
5% AEP Flood Level	4.6m AHD	4.6m AHD	4.6m AHD
10% AEP Flood Level	4.5m AHD	4.5m AHD	4.5m AHD

Velocity (1% AEP flood event)	3.0m/s*	3.0m/s*	3.0m/s*
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* Minimal velocity information is available for this property therefore the provided velocity is approximate only.

SITE SPECIFIC CONSIDERATIONS

1. Current NSW Government legislation requires climate change to be considered as part of this Floodplain Risk Management Study and Plan. Climate change related information evolves with time and it is expected that existing flood behaviour and levels may change in the future.
2. All applications for buildings, and the like, must take into account the projected 2050 flood information. All subdivision and other long-term planning must take into account the projected 2100 flood information.
3. Information provided in this flood certificate uses previous State Government sea level rise benchmarks (400mm and 900mm for the 2050 and 2100 horizon's respectively). On Tuesday 10th February 2015 Council's Policy & Resources Committee resolved to no longer use State Government benchmarks and to "Establish a sea level rise benchmarks for planning purposes based on a 2030 horizon 100 mm, a 2050 horizon of 230 mm and 360 mm horizon for 2100". The new benchmarks will be incorporated into the flood information in future. Until studies incorporating the new benchmarks are undertaken Council will continue to use the best available information.

STANDARD CONSIDERATIONS

Properties below the Flood Planning Level:

Council considers the land in question to be below the flood planning level and therefore subject to flood related development controls. The conditions as set out below will reduce flood risk in flood events up to the Flood Planning Level, however the property may still be subject to flooding at higher levels during rare flood events.

Development controls apply to flood affected properties.

Development conditions will vary depending on flood hazard, hydraulic category as well as the type of development that is proposed. Please refer to the following documents for information on Council's flood related development controls and the NSW State Government's Floodprone Land Policy.

- Shoalhaven Development Control Plan – Chapter 9: Development on Flood Prone Land <http://dcp2014.shoalhaven.nsw.gov.au/main-category/whole-document>
- NSW Floodplain Development Manual 2005: <http://www.environment.nsw.gov.au/floodplains/manual.htm>

DISCLAIMER

Your enquiry relating to the likelihood of the land specified in the application being flooded has been referred to the Council's Floodplain Engineer.

In responding to your application the Council seeks to bring to your attention the fact that pursuant to s.733 of the Local Government Act a council does not incur liability in respect of the giving of any advice furnished in good faith by the Council relating to the likelihood of any land being flooded or the nature or extent of any such flooding.

The Council does not have a legal obligation to provide advice to you and to the extent that this reply is giving advice, the Council provides that advice in good faith with the intention of preserving, so far as is legally possible, the Council's immunity from liability pursuant to s.733 of the Local Government Act.

While all reasonable care has been taken to ensure the accuracy of the information given in this reply, its purpose is to provide a general indication of flood risk in the area. Flood lines shown on Council maps indicate the approximate extent of flooding only in relation to the abovementioned land.

The information provided may contain errors or omissions and the accuracy may not suit the purposes of all users. A site survey and further investigation are strongly recommended before commencement of any project based on this data.

The information given is the most current information at the time of the request. It is to be noted, however, that flood information is constantly reviewed and updated and as such, the information contained in this regard is current only on the day of issue.

Before acting upon the information provided in this reply, the Council urges you to obtain separate and independent advice as Council, in giving this information, does not intend it to be relied upon in such a fashion as to impose liability upon the Council.

Should you not be prepared to accept the information contained in this reply upon that basis then you should immediately notify Council.

GLOSSARY

AEP (Annual Exceedance Probability) means the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage – for example a 1% AEP flood event has a 1% chance of occurring in any one calendar year.

AHD (Australian Height Datum) is a common national surface level datum corresponding approximately to mean sea level.

Flood fringe is the part of the floodplain remaining after the floodway and flood storage areas have been defined.

Flood planning area is any land identified as being flood affected in the 1% AEP flood event plus freeboard.

Flood planning level (FPL) is the 1% AEP flood level plus freeboard. The FPL is used for planning purposes, as determined in floodplain risk management studies and incorporated in floodplain risk management plans.

Flood prone land means any land susceptible to flooding up to the probable maximum flood event (that is, land within the floodplain) as identified in an adopted Council flood study or floodplain risk management study and plan.

Flood storage areas are those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.

Flood study is a technical investigation of flood behaviour. It defines the nature of flood risk by establishing the extent, level and velocity of floodwaters. The study also provides information on the distribution of flood flows across various sections of the flood plain for the full range of flood events up to and including the PMF.

Floodplain risk management plan is a plan developed in accordance with the principles and guidelines contained in the NSW Government Floodplain Management Manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

Floodplain risk management study is a study that identifies and compares various risk management options. This includes an assessment of their social, economic, ecological and cultural impacts, together with opportunities to maintain and enhance river and floodplain environments.

Floodway means those parts of the floodplain where a significant discharge of water occurs during floods. They are often aligned with natural defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood levels.

Freeboard is currently 0.5m for all catchments in the Shoalhaven. Freeboard is a factor of safety used to set the FPL (i.e. $FPL = 1\% \text{ AEP flood level} + \text{freeboard (0.5m)}$).

Freeboard takes into account uncertainties in flood modelling and climate change predictions, local factors that cannot be included in the flood model or wave action caused by wind, boats or vehicles driving through flood waters.

Hazard category represents the risk or danger to personal safety, evacuation movements and buildings and structures within the Flood Planning Area during the 1% AEP flood. There are only two possible hazard categories – high or low.

Hydraulic category describes the function of a specific part of the Flood Planning Area in conveying flood waters during a 1% AEP flood. There are three possible hydraulic categories – floodway, flood storage or flood fringe.

Probable maximum flood (PMF) is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain.

Provisional is used for hazard categories that have been determined in a flood study. Hazard categories are provisional until the floodplain risk management study and plan has been completed and adopted by Council, as this document considers additional risks, not considered during the flood study.



3. CONCLUSIONS

3.1 Proposed Development

For the reasons detailed above, and as agreed in consultation with Council and DLWC, hydraulic modelling of the proposed development has not been undertaken. There is a need however, to consider (amongst other things) the flood hazard and structural assessment (with regard to velocity of floodwaters and impact by flood debris) of the proposed development. In quantifying the flood hazard, some important issues for consideration include:

- damage to the plant, including as a result of flood debris or structural failure,
- damage to the plant due to the possible buoyancy of equipment,
- malfunction of the plant (or any services on which the plant relies for operation) as a result of inundation and the associated risk of such malfunction to other users of the floodplain,
- access and evacuation.

3.2 Future Development

In consultation with Council and the DLWC, it is agreed that any future development of the Manildra Starches Plant within the intensively built-up area, as defined on Figures 2 and 4, will not require hydraulic modelling to quantify the hydraulic impacts and cumulative effects. The hydraulic impacts and cumulative effects of such developments are considered to be insignificant given the intensive development already present. As mentioned in previous sections, the only opportunity for floodwaters to pass through the intensively built-up area of the site is through the limited number of gaps or openings between the plant and associated buildings. Although these gaps or openings may be relocated to accommodate any future development, the movement of overland floodwaters will never be completely blocked, as gaps or openings similar to those which currently exist will always be maintained for trafficability requirements.

Any proposed future development is not exempt from flood hazard and structural assessment as outlined in Section 3.1

3.3 Future Development on the Northern Floodplain

This study has identified that there is no need for hydraulic modelling of the proposed, or any future proposed development within the existing intensively built-up area of the Manildra Starches Plant (shown on Figures 2 and 4). However during the course of this investigation, and in consultation with Council and the DLWC, it should be noted that any further development upon the northern floodplain (outside the built-up area shown on Figures 2 and 4), and in particular any development adjacent to the river bank, has the potential to increase the cumulative impact on flood levels and velocities.

The main areas of concern on the northern river bank are the unrestricted low lying areas between high ground and the existing developments, termed flowpaths or floodways. The bank is relatively

