
MANILDRA GROUP



**Ex. DAIRY FARMERS SITE 220 BOLONG RD
BOMADERRY**

FLOOD MITIGATION & MANAGEMENT PLAN

DOCUMENT CONTROL

This plan has been prepared in consultation with the Manildra Group Engineering Manager and any amendments to this plan will be authorised by the Engineering Manager or delegate.

Revision No.	Date	Prepared By	Authorised By	Comments
1.0.A	20/03/2015	R. Werfel	T. Barton	Original
1.0.B	3/09/2021	J. Studdert	L. Reali	Updated to include Supagas CO2 Plant.

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1. INTRODUCTION

This plan describes the procedures for managing flood risks to ensure the protection of infrastructure and human safety at the former Dairy Farmers site, 220 Bolong Rd Bomaderry, now owned by the Manildra Group of Companies.

The site includes the operating businesses and personnel as follows:

1. Manildra Group administration offices (~ 20 personnel); and
2. Supagas Carbon Dioxide Plant, owned and operated by Supagas Pty Ltd (2 personnel on site)

N.B. the former Argyle Meats facility located at this site is no longer operating.

The site is situated on a wide alluvial floodplain of the Shoalhaven River. The Shoalhaven River is 300 kilometres long and has a catchment area of approximately 7,500 square kilometers. The river is subjected to tidal influence up to 59 kilometres upstream of the river mouth.

The final tributary of the Shoalhaven River is Broughton Creek. The alluvial floodplain extends northward up the valley to the town of Berry. Broughton Creek also acts as part of the northern boundary of the Manildra Environmental Farm in a number of locations.

The Supagas Carbon Dioxide Plant is approved as a modification (MOD) under Shoalhaven Starches Development Consent 06_0228 – MOD 15.

This plan has been developed to meet the requirements of Condition 26A of the Consent which is shown in Table 1 below.

Table 1 Conditions of Consent

Condition 26A	Section in Plan
<i>a) be prepared in consultation with Council and submitted to the Secretary prior to operation of each modification;</i>	Section 1 and Appendix 6
<i>b) detail the procedures for managing flood risks during construction, demolition and operation, including flood recovery measures, procedures for ensuring the protection of infrastructure and human safety;</i>	Section 7
<i>c) identify assembly points, emergency evacuation routes, flood warning alarms and evacuation procedures.</i>	Section 7 & Appendix 4
<i>d) describe the controls to be implemented to ensure plant, equipment and stockpiles do not become floating debris during flood events</i>	Section 7
<i>e) demonstrate the development will not unduly increase the dependence on emergency services.</i>	Section 6.3

This plan has been developed in conjunction with the existing Shoalhaven Starches Flood Mitigation and Management Plan SA-P-0212 and in accordance with the recommendations set out in:

- Chapter G9 of Shoalhaven Development Control Plan 2014.

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- Recommendations set out in the Floodplain Management manual (Draft) prepared by the Department of Land & Water Conservation (DLWC).
 - New South Wales State Emergency Service (SES) Shoalhaven City Local Flood Plan 2004 – A Sub-Plan of the Shoalhaven Local Disaster Plan.
 - Condition 26A of Shoalhaven Starches Project Approval 06_0228.

The Key stages of the process were:

- Consultation with Shoalhaven City Council and the SES Local Controller to establish all requirements for the Plan;
- Review the Local Flood Plan to determine any additional requirements;
- Confirm the operational procedures for the facilities;
- Incorporate the results of the recent flood modeling work;
- To prepare a Draft plan for review by Supagas, Shoalhaven Council and the SES; and
- Submit the final Plan based on comments received on the Draft Plan.
- Evidence of consultation with Council is shown in Appendix 6.

2. LOCATION OF THE SITE

2.1. *Regional Context*

The site is located adjacent to the Shoalhaven River on the eastern side of the confluence with Abernethy Creek, approximately 12 km from the mouth of the Shoalhaven River.

Flooding on Broughton Creek or any of the other smaller creeks, such as Abernethy's Creek which feed the low lying areas, such as the Manildra Group Environmental Farm, in themselves can create nuisance flooding. However, this type of flooding can be compounded if there is existing problems attributable to flooding on the main river.

Furthermore, storm surge offshore of the river's entrances have historically aggravated flooding effects within the Shoalhaven floodplain. Entrance conditions on the lower river at Shoalhaven Heads can also contribute to low level flooding if the Shoalhaven River is closed to the ocean at Shoalhaven Heads. A situation that can result in significant backwater effects in the lower reaches of the river.

2.2. *Local Context*

Road access to the site is gained off Bolong Road on a private bitumen surfaced road at the main entrance which is approximately 375m to the west of the railway level crossing on Bolong Road.

The location of the Manildra Group Shoalhaven Starches facility and the former Dairy farmers site, located further east on the banks of the Shoalhaven River, is shown in Figure 1 below.



Figure 1 – Bolong Road Looking East over the Starches site to ex Dairy Farmers site.

3. DESCRIPTION OF THE FACILITY

SUPAGAS CARBON DIOXIDE PLANT

The Supagas Carbon Dioxide Plant (CO₂) Plant captures waste gas from Shoalhaven Starches fermenter tanks at the factory and treats the gas to a food grade standard. The facility includes a pre-treatment plant near the fermenter tanks, above ground and underground pipework and the main CO₂ plant comprising of compressors, driers, liquefiers and storage tanks.

The waste CO₂ gas is purified, converted to a liquid and transported off-site to food and hospitality markets for use in carbonated drinks. Supply of raw materials and delivery of the finished products is primarily delivered by road transport.

At the main entrance into the plant off Bolong Road, Emergency Services can enter at this point to access the site. A site plan showing the layout of the Supagas plant is shown in **Appendix 5**.

The former Dairy Farmers building is now occupied by Manildra Group administration staff utilizing existing office spaces.

4. STAFFING CHARACTERISTICS

MANILDRA GROUP ADMINISTRATION STAFF

There are approximately 20 staff located within the existing ex. Dairy Farmers building. The staff are present during normal business hours of 8:00 am to 5:00pm Monday to Friday.

SUPAGAS CARBON DIOXIDE PLANT

The Supagas plant operates with **2 staff**, 5 days a week on site, during normal business hours. There ARE also 2 heavy transport drivers per day travelling to and from this site.

5. SITE CHARACTERISTICS AND UNIQUE RISKS

During recent localized flooding events it has been observed that floodwater approaches the site from the North at the Manildra Group Environmental Farm side of the property. This being the case the Manildra Environmental Farm Manager will contact the Shoalhaven Starches' WHS Manager when floodwaters are approaching who can then provide regular updates on the rate of rise of floodwaters to the Manildra Group administration personnel & the Supagas Site Manager.

Close communication with the Manildra Farm Manager can provide an early warning to both facilities of the potential localized flood threat. A threat that can rapidly develop prior to the receipt of a Flood Alert/Advice for the Shoalhaven River from the SES, due to localized conditions on the floodplain which the Manildra Environmental Farm is located.

The WHS Manager will maintain close contact with Manildra Group staff and Supagas Site Manager and will keep up-to-date notifications on a regular basis during a flood event.

Machinery and equipment that are vulnerable to water ingress will need to be relocated to higher ground and sand bagging or other means to stop water entering these areas will need to be co-ordinated and implemented.

6. FLOODING IMPACTS

This section looks at the impact of local flooding due to the nearby Abernethy's Creek and Bomaderry Creek and more importantly as a result of the Shoalhaven River. Flood levels quoted in this report have been sourced from the Webb McKeown & Associates, July 2000 report on the hydraulic assessment of cumulative effects.

6.1. Local Flooding Impacts

There is no known flood study investigating local flooding in Abernethys Creek and Bomaderry Creek. The ratio of catchment area to catchment storage in both catchments is low which means the risk of severe flooding is decreased.

The depth of inundation as a result of local flooding from Bomaderry Creek and Abernethys Creek is expected to be less critical than the effect of regional flooding in the Shoalhaven River.



Figure 2 - Plant Layout and Main Evacuation Route to Bomaderry via Bolong Road

6.2. Regional Flooding Impacts

The 1% Annual Exceedance Probability (AEP) flood level in the Shoalhaven River, at the site according to Shoalhaven City Council's Flood Certificate for the site (**Appendix 3**) is 5.3m AHD with a projected rise to 5.4m AHD in 2100 due to climate change. Council's Flood Certificate also identifies that the site is subject to a high hazard floodway categorization. A review of the lower Shoalhaven River Floodplain Risk Management study shows however that the overall property is a mix of both high hazard floodway within the southern portions of the site; and high hazard flood storage within the northern portion of the site. The location of the existing factory building is located just within the high hazard floor storage area.

The existing factory building has floor areas that range in the order of 6.27m AHD; and therefore above 1% AEP flood level of 5.3m AHD (and projected 5.4m AHD level for 2100). Indicative ground levels at the 220 Bolong Road site are around 4.5 to 5.5 m AHD meaning areas of the site will be inundated during the 1% AEP flood.

Equipment will have to be prepared for inundation if the predicted flood level is higher than 4 m AHD. In an extreme flood the calculated flood level through the study area is 7.6m AHD. In both the 1% AEP flood and extreme flood the evacuation route from the site will be inundated, therefore evacuation of all personnel will be required from the site.

The critical storm duration producing a peak 1% AEP flow at Nowra was found to be 36 hours. From the time Manildra Group receives the early flood warning there is approximately seven hours before the access road is cut at the 1% AEP flood. This time can vary and it is critical that the flood level at Nowra Bridge be continually monitored by the SES to determine the rate of rise in the Shoalhaven River.

The lowest point along Bolong road is adjacent to Abernethy's Creek and has a level of approximately 4.0m AHD. Sections of Bolong Road are also lower than the 1% AEP flood level and would be cut by floodwaters as a result. Whilst it is preferable to have an evacuation route located at a level greater than 1% AEP flood, the filling required could itself increase the upstream flood levels.

6.3 Flood Assessments

A Flood Compliance Report has been completed in accordance with Chapter G9: Development on Flood Prone Land (DCP2014) for the Supagas CO2 Plant (MOD 15). The report concludes the proposed works do not significantly increase the 1% AEP, or PMF / Extreme event flood level on lands outside those owned by Shoalhaven Starches.

The works associated with MOD 15 will increase (by 2) the number of workers on site who may be subject to flood risk. The proposed works will not occupy escape routes or cause workers to become trapped. The flood evacuation routes and actions detailed in this plan as a result of the MOD 15 development will not unduly increase the dependence on emergency services.

All new buildings and structures are designed from flood compatible materials and are built to withstand the forces of flood waters, debris and buoyancy forces up to the 0.2% AEP flood events.

A structural flood engineer's report has been obtained for the buildings and structures built for MOD 15 in accordance with condition 26F and 26G of Shoalhaven Starches Development Consent 06_0228.

7. FLOOD EVACUATION PLAN

The evacuation plan has been compiled through the assistance of Shoalhaven City Council and the New South Wales State Emergency Service (SES).

Page 11 contains a flood evacuation plan in the form of a flow chart. A flow chart was adopted to display the information in order to simplify the flooding and evacuation process. The proposed evacuation plan essentially follows the existing practices undertaken by Manildra Group, the SES and Council during flooding.

The Flood Evacuation Plan is described in the following steps:

1. Manildra Group receives an early flood warning from the SES when the level in the Shoalhaven River near the Nowra Bridge reaches a rising level of 1.3m AHD;
2. The Manildra Group WHS Manager assumes responsibility for receiving flood observations and flood watch warnings and provides regular updates to the Supagas site and Manildra Group personnel located at 220 Bolong Rd.
3. There is then ongoing communication between Manildra Group and the SES to monitor the existing level and the expected peak flood level in the Shoalhaven River;
4. Manildra Group will then compare the expected peak flood level with the access road level to determine if the access road will be cut; this will occur at a flood level of about 4m AHD.
5. If the access road will be cut then Supagas will initiate the plant shutdown and evacuate personnel, including Manildra group staff.

6. All personnel are to assemble at the flood evacuation assembly point. Once all personnel are accounted for, then proceed via the Bolong Rd and Railway St flood evacuation route (refer to **Appendix 4**)
7. If the expected peak flood level will not exceed the level of the access road then Supagas will not initiate the plant shutdown. Ongoing communication between Manildra Group, Supagas and the SES will be required until the flood level drops below 1.3m AHD.
8. It is estimated that Floodwaters will enter the Manildra Shoalhaven Starches site at 3.8m AHD

The Flood Evacuation Plan should now be used as a tool in the decision making process when the Shoalhaven River is in flood. The key to the success of the Flood Evacuation Plan during a flood is the ongoing communication between Manildra Group, Supagas and the SES.

7.1 Flood Management Plan

1. Action 1 plan for when the river is predicted to peak at 3.50m AHD (at Nowra Bridge)

Action	People	Hours
Prepare the following: <ul style="list-style-type: none"> Diesel pumps 100 sandbags 100m rolls of black builders heavy duty plastics for sealing Hire diesel pumps 	4 workers	8
Secure or remove from site any items that may become floating debris during flood events. e.g. pallets, bins, stockpiles, drums, etc.	2 workers	4

2. Action 2 plan for when the river is predicted to peak at 3.80m AHD (at Nowra Bridge)

Action	People	Hours
All action 1 items		
Check the main stormwater drain that flows to the River is clear of debris (located on the main driveway on the southern boundary fence line).	1 person	0.25

3. Action 3 plan for when the river is predicted to peak at 4.20m AHD (at Nowra Bridge)

Action	People	Hours
All action 2 items		
Remove locomotives off site (by Manildra)	Rail	1 hour
Notify the Manildra Rail Coordinator that inbound train is to stop at Port Kembla.	1 supervisor	0.1
Move any empty shipping containers above flood levels or re-locate off-site.	1 supervisor	6 hours

	2 drivers	
All switch rooms – check the doorway for leaks, and waterproof if required	2 workers	1 hour
Non-essential personnel (i.e. office staff, contractors, etc) to be evacuated from the site. Remaining personnel to keep plant operating & prepare for plant shut.		
Consider closing the main stormwater valve if flood water from the River flows back through the stormwater pipe and enters the site. This is the lowest point on the site at ~ 4.3m AHD.	1 person	0.25

4. Action 4 plan for when the river is predicted to peak at 4.50m AHD (at Nowra Bridge)

Action	People	Hours
All action 3 items		
Keep plant running	2 workers	
Monitor rain forecast	1 supervisor	
Main switch yard switch room – place sandbags, plastics for sealing and waterproof the bricks. A diesel pump should be placed to pump out the water from the pit in the switch room after consultation with electricians. N.B the former Dairy farmers building main switchyard and transformers are above the 1% AEP Flood Event of 5.4m.	2 workers	2 hours

5. Action plan for when the river is predicted to peak at 4.80m AHD (at Nowra Bridge)

Action	People	Hours
All action 4 items		
Prepare for plant shut down when river reaches 4.5m AHD. N.B. The Supagas Plant can be operated remotely, including start-ups and emergency shut-downs. The Supagas Electrical switchroom and transformer is above the 1% AEP Flood Event of 5.4m.	2 workers	1 hours
Site flooding to be monitored and shut down to be implemented as required.		
Remaining personnel to be evacuated from site.		
Note: Flood evacuation assembly point is the Shoalhaven Starches Main Administration Building (opposite Service Station)		
Note: Flood evacuation route is from Main Administration Building up Railway Parade to Cambewarra Road.		

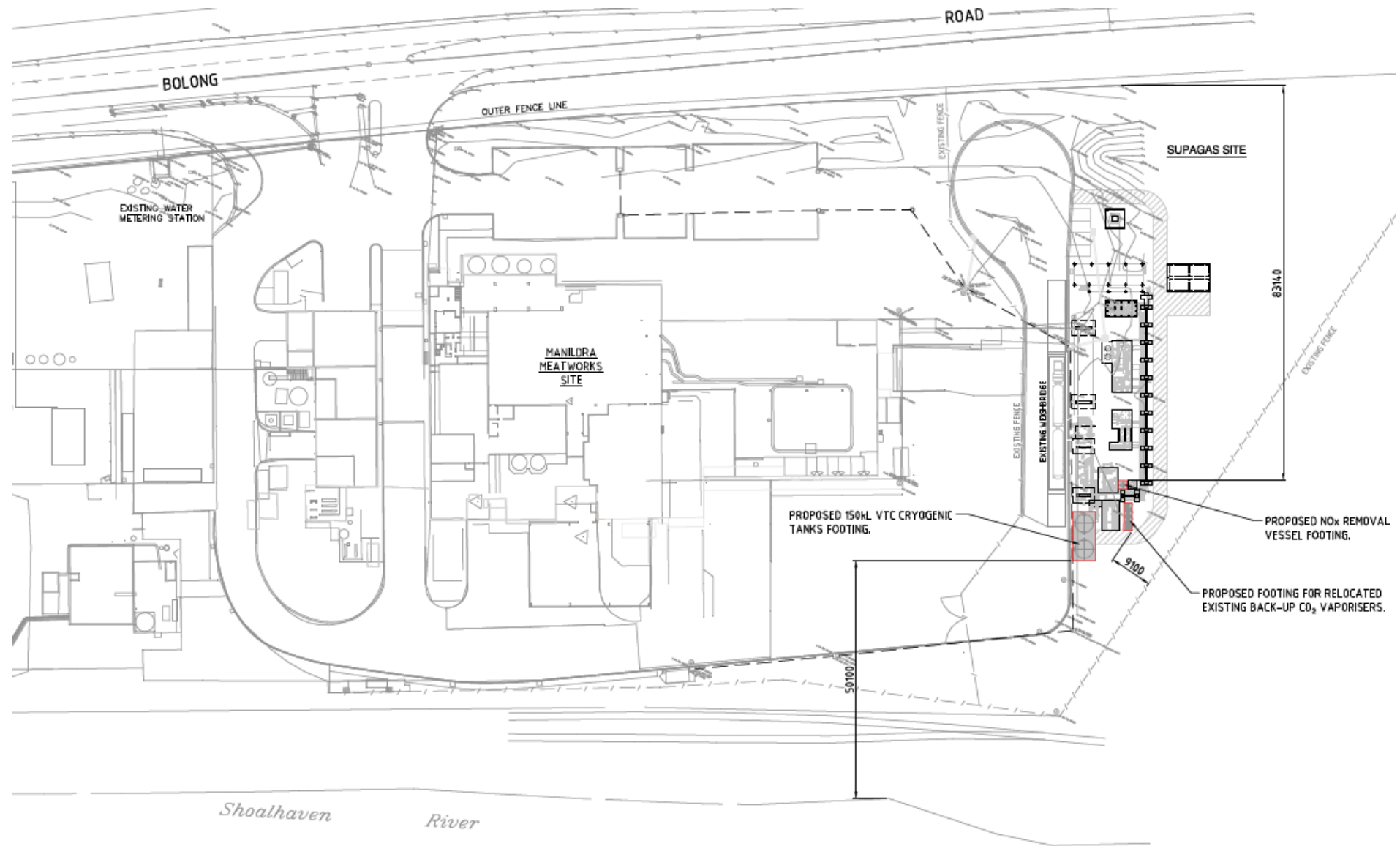
8. EMERGENCY CONTACT NUMBERS

Organisation	Telephone Number
Fire Brigade	000 Fire Brigade Pumper - 0407 229 811
Ambulance	000
Police	000 Nowra Police Station – 4421 9699
Shoalhaven Hospital	02 442 13111
SES	13 25 00
EPA	131 555 or 9995 5555
SafeWork Nowra	02 4428 6700 Bus Hrs Mob – 0400 874 120
Shoalhaven City Council	4429 3111 4421 3100 (emergencies after hours)
SupaGas CO2 Plant	0457 848 635 (Site Manager) or 0491 158 611 (Plant Operator)
Manildra Group	0407 494 663 (WHS Manager) or 0407 220 175 (Site Manager)

9. REFERENCED DOCUMENTS

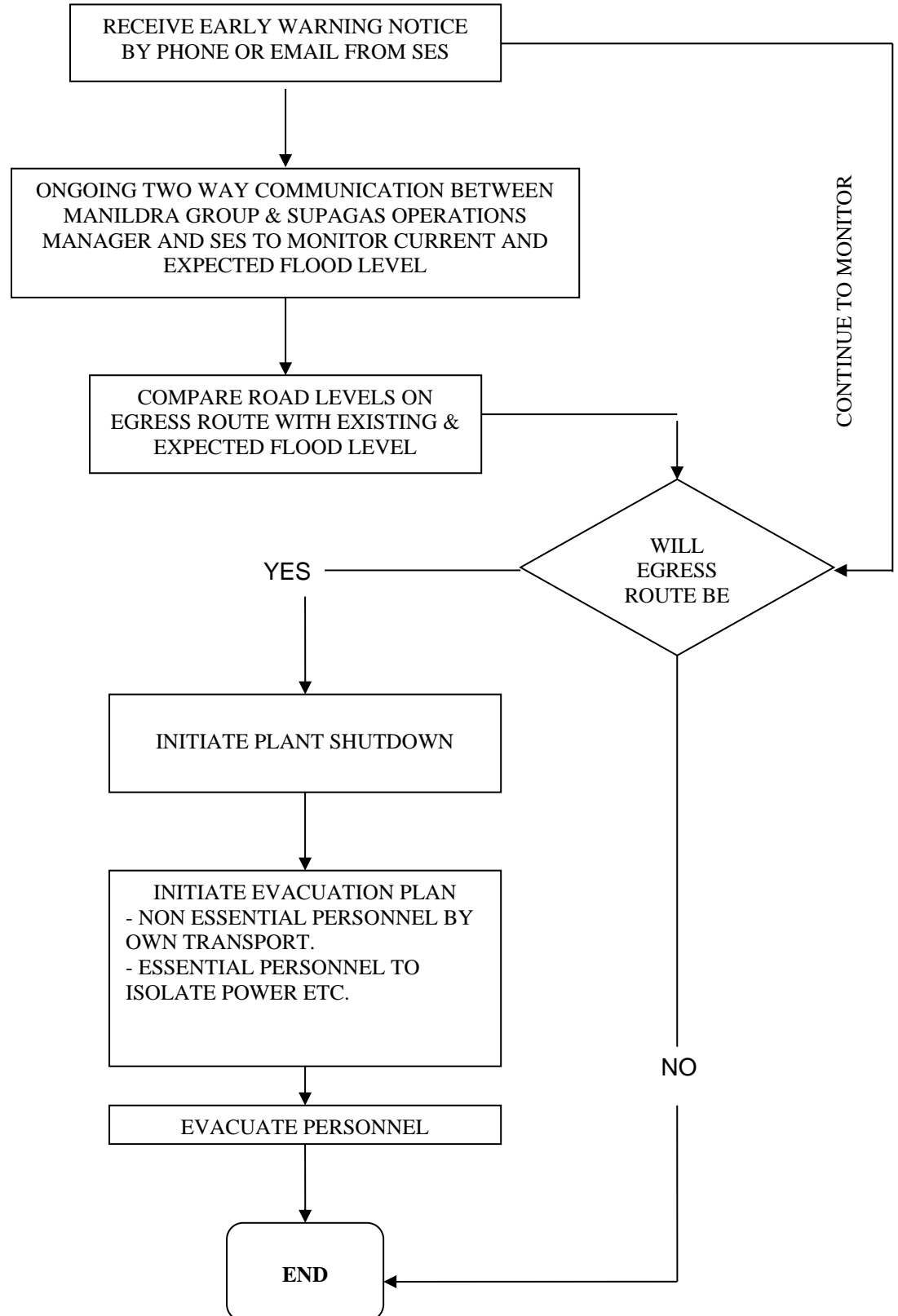
1. Floodplain Management Manual, Draft, NSW Government (ISBN073103709).
2. Shoalhaven Starches Pty Ltd, Rezoning Proposal, Bolong Road, Bomaderry, Report on Flooding Issues, Gutteridge Haskins & Davey, June 1999.
3. Manildra Group, Proposed BOC Gases Plant and Dairy Farmers Pond at Bomaderry Hydraulic Assessment of Cumulative Effects, Webb, McKeown and Associates, July 2000.
4. Public Works Department, Lower Shoalhaven River Flood Study, Report No PWD 87049, April 1990.
5. NSW SES Shoalhaven City Local Flood Plan – February 2004.
6. Shoalhaven City Council – Flood Certificate
7. Shoalhaven Starches Flood Mitigation & Management Plan SA-P-0212

APPENDIX 1 – SITE PLAN



APPENDIX 2 – FLOOD EVACUATION FLOWCHART

FLOOD EVACUATION PLAN



APPENDIX 3 – FLOOD CERTIFICATE

FLOOD CERTIFICATE

According to the *Lower Shoalhaven River Floodplain Risk Management Plan – Climate Change Assessment (2011)* this property, 220 Bolong Rd, BOMADERRY - Lot 143 DP 1069758, **is affected by the 1% AEP flood event.**

FLOOD INFORMATION

Year	Existing	Projected 2050	Projected 2100
Flood Planning Level	Not applicable	5.8m AHD	5.9m AHD

Hazard Category	High	High	High
Hydraulic Category	Floodway	Floodway	Floodway

Probable Maximum Flood Level	7.6m AHD	7.6m AHD	7.6m AHD
1% AEP Flood Level	5.3m AHD	5.3m AHD	5.4m AHD
2% AEP Flood Level	4.8m AHD	4.8m AHD	4.9m AHD
5% AEP Flood Level	4.3m AHD	4.3m AHD	4.3m AHD
10% AEP Flood Level	4.4m AHD	4.4m AHD	4.4m AHD

Velocity (1% AEP flood event)	1.4m/s	1.4m/s	1.3m/s
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SITE SPECIFIC CONSIDERATIONS

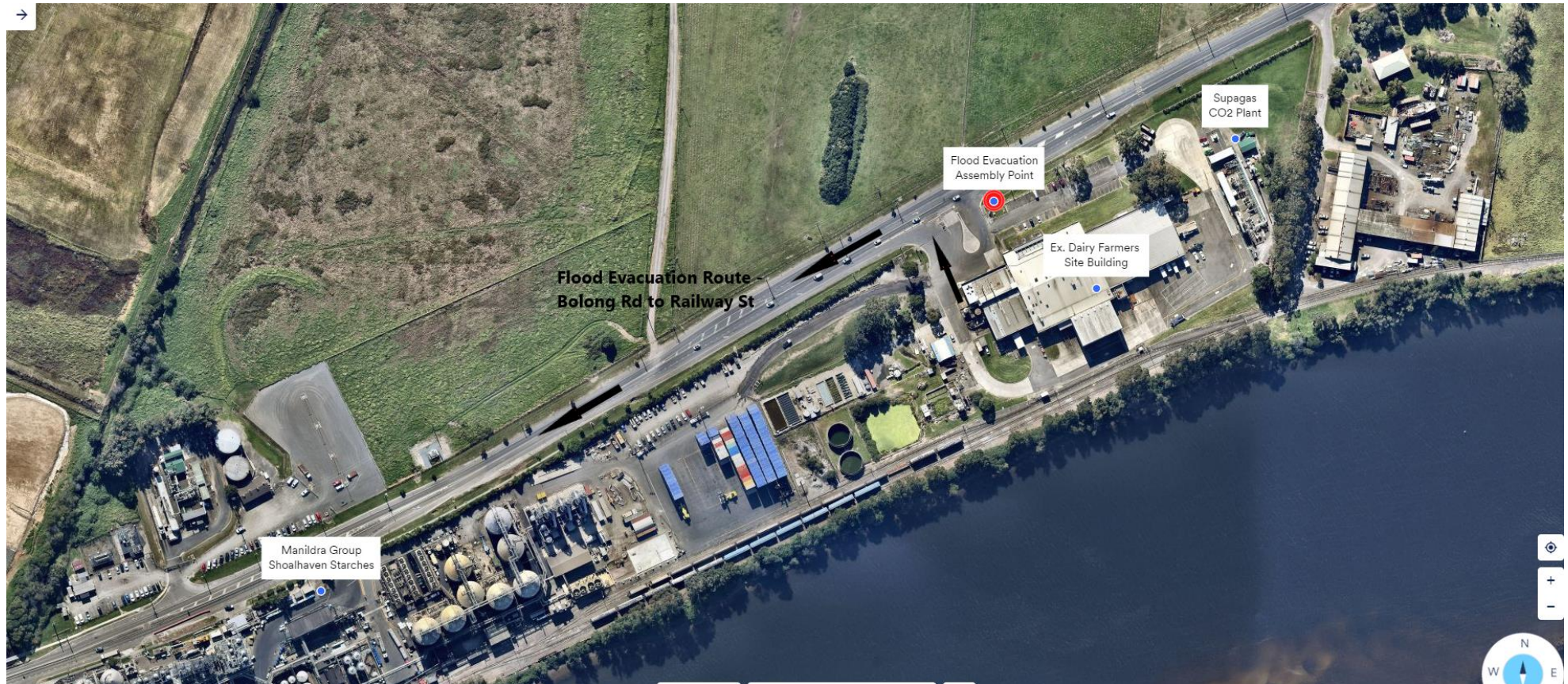
1. Current NSW Government legislation requires climate change to be considered as part of this Floodplain Risk Management Study and Plan. Climate change related information evolves with time and it is expected that existing flood behaviour and levels may change in the future.

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.

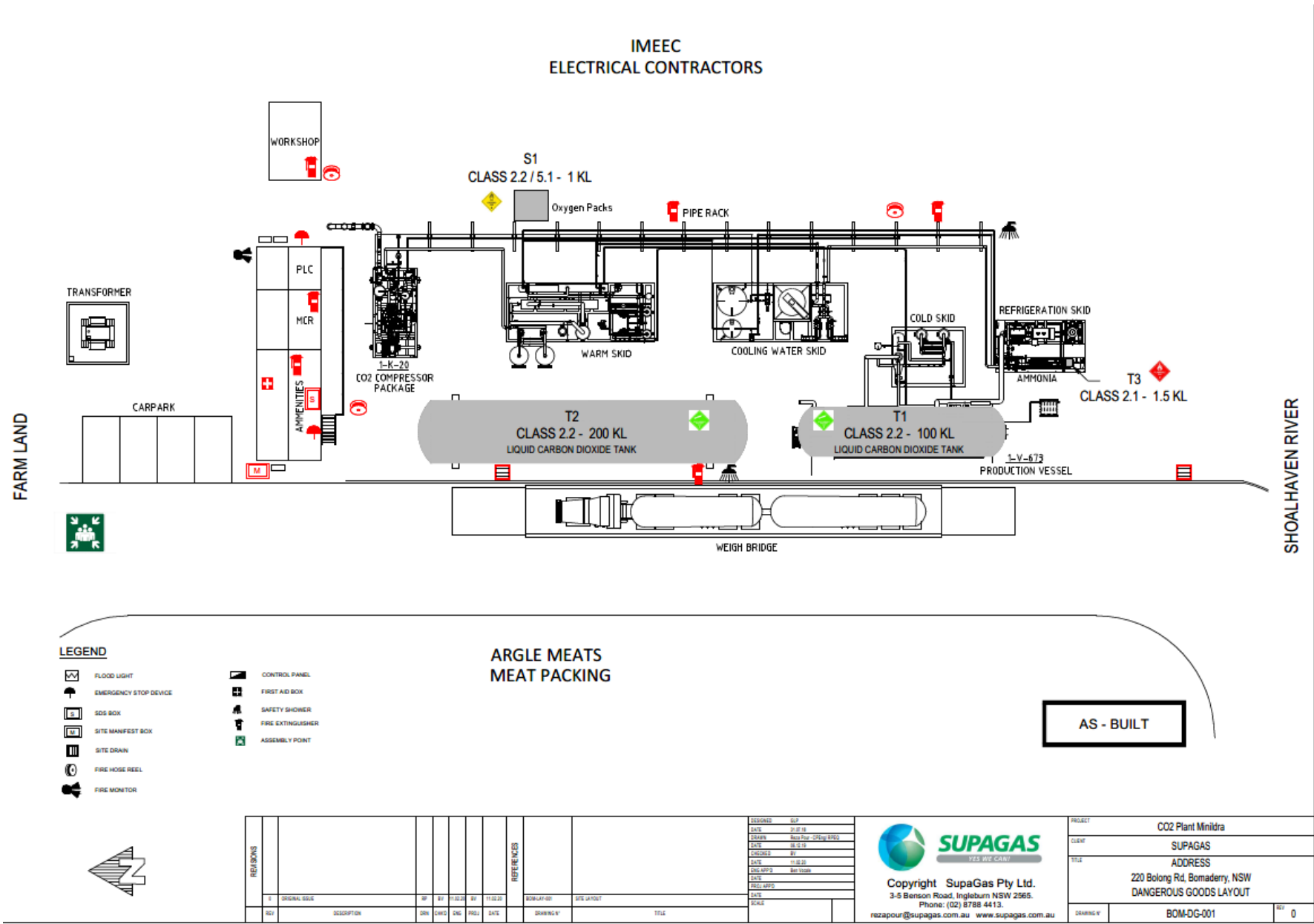
Information provided in this flood certificate uses previous State Government sea level rise benchmarks (400mm and 900mm for the 2050 and 2100 horizon's respectively). On Tuesday 10th February 2015 Council's Policy & Resources Committee resolved to no longer use State Government benchmarks and to "Establish 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.

2. Not all of the property is categorised high hazard floodway. Part of the property is categorised high hazard flood storage. For more specific information regarding the different hazard and hydraulic categorisations on this property please contact Council's Natural Resource and Floodplain Unit on (02) 44293392.

APPENDIX 4 – SITE LOCATION



APPENDIX 5 – SUPAGAS PLANT SITE PLAN



APPENDIX 6 – CONSULTATION

The Manildra Group Shoalhaven Starches Flood Mitigation and Management Plan, ex. Dairy Farmers Site, 220 Bolong Rd Bomaderry, Rev. 1.0.B, has been prepared in consultation with Council. A copy of the consultation is shown below.

The recommendation for the installation of Flood Marker(s) along the bank of Shoalhaven River adjacent to the site as an additional measure will be implemented and updated accordingly in the next revision of the plan.

From: Tanvir Ahmed <Tanvir.Ahmed@shoalhaven.nsw.gov.au>
Sent: Wednesday, 1 September 2021 10:15 PM
To: John Studdert
Cc: Andre Vernez; Mark Stone
Subject: RE: Shoalhaven Starches Development Consent 06_0228 - Condition 26A Flood Mitigation & Management Plan update

Hi John

Thank you for your email.

I reviewed the Flood Mitigation and Management Plan. The evacuation plan is detailed and prepared in accordance with the condition 26A. The subject site is within the High Hazard Floodway. My recommendation is to installation of Flood Marker(s) along the bank of Shoalhaven River adjacent to the site as an additional measure. This can assist to closely monitor the water levels by the manager in the event of heavy rainfall. It is noted that flood warning service is provided by BOM for the Shoalhaven River.

Kind Regards

Tanvir Ahmed
Floodplain Engineer
Shoalhaven City Council

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