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Supporting Documentation



Wyong
Shire
Council

RZ/15/2014

Flood Assessment Report

Lot 1 DP 1012816
31 Palmdale Road
Palmdale NSW

Report Prepared for:
Stevens Holdings Pty Ltd

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Prepared by:
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TABLE OF CONTENTS

1.0	INTRODUCTION	1
1.1.	Background and Context.....	1
1.2.	The Site	1
1.3.	Proposed Development.....	2
2.0	FLOOD CONDITIONS.....	2
3.0	DCP COMPLIANCE.....	5
4.0	FLOOD EMERGENCY MANAGEMENT PLAN.....	9
4.1.	Flood Warnings.....	9
4.2.	Evacuation Conditions.....	11
4.3.	Site Flood Emergency Response Plan.....	12
4.4.	Evacuation Plan.....	13
5.0	CONCLUSIONS AND RECOMMENDATIONS	14
6.0	REFERENCES.....	15

APPENDICES

APPENDIX A

Site Survey

APPENDIX B

Flood Depth and Velocity Maps

APPENDIX C

Flood Hazard Map

APPENDIX D

Hydraulic Category Map

APPENDIX E

Emergency Response Classification Maps

APPENDIX F

Wyong Shire Flood Emergency Sub Plan

APPENDIX G

Flood Management Plan

1.0 INTRODUCTION

1.1. Background and Context

STORM Consulting were commissioned by Stevens Holdings Pty Ltd to prepare a Flood Assessment Report to support a future rezoning application to Wyong Shire Council with respect to Lot 1 DP 1012816, 31 Palmdale Road, Palmdale NSW.

The development site is located within the floodplains of the Ourimbah Creek and Canada Drop Down Creek, and is partially inundated by the 1 in 100 year flood event.

This assessment has been prepared with the use of the following Local and State Government policies:

- NSW Floodplain Development Manual (2005)
- Wyong Shire Development Control Plan (2013) (DCP)
- Ourimbah Creek Flood Study - DRAFT (2014)

The assessment considers the following information:

- Flood Conditions;
- Compliance with Wyong Shire Councils DCP;
- Flood Emergency Management.

1.2. The Site

The site is located within gently undulating terrain within the floodplain of the lower reaches of Ourimbah Creek catchment which drains into Tuggerah Lakes. The site is located between two creeks: Canada Drop Down Creek which passes through the northern part of the site within bushland; and Ourimbah Creek which passes to the south of the site across Palmdale Road. The site is located approximately 400m to the west of the confluence of the above mentioned creeks.

The Palmdale Lawn Cemetery and Memorial Park is located to the immediate west of the site. The Pacific Highway is located approximately 300m to the south east of the site.

A broad ridge runs through the site from south west to north east. Levels along the ridge are generally at RL14.2m to RL14.7m AHD. To the north the levels fall away to Canada Drop Down Creek. To the south of the ridge the levels fall away to a wide gully which falls from RL11.7m to RL10.9m AHD (west to east). Towards the road frontage the levels grade upward to Palmdale Road which is at RL13.4m to RL13.2m AHD along the site frontage.

A single storey residence exists on the ridge within the site with floor levels of RL15.04m to RL15.13m AHD. Access to the residence is via a gravel driveway which runs through the middle of the site in a north-south direction. The driveway runs through the wide gully and at its lowest point is at approximately RL11.86m AHD

From the driveway, Palmdale road falls toward the east (towards the Pacific Highway) where it crosses Ourimbah Creek at its lowest point, rising again toward the Pacific Highway.

The site location is shown in Figure 1. Refer to Appendix A for a site survey.

1.3. Proposed Development

Palmdale Lawn Cemetery and Memorial Park currently operates within land to the immediate north of the subject site. The cemetery are proposing to extend operations into the subject site located at Lot 1 DP 1012816, 31 Palmdale Road.

The future plans for the land within the subject lot are for memorial sites and an access road from the lot to the east (41 Palmdale Rd). Some parking areas may be required. The existing dwelling is to be removed. An ornamental wetland is to be constructed in the low-lying area towards the site frontage.

The lot is currently zoned Rural Landscape. The applicant proposes to rezone the lot into two parts: part (cemetery) SP2 Infrastructure Special Purpose and part (creek corridor) E2 Environmental Conservation.

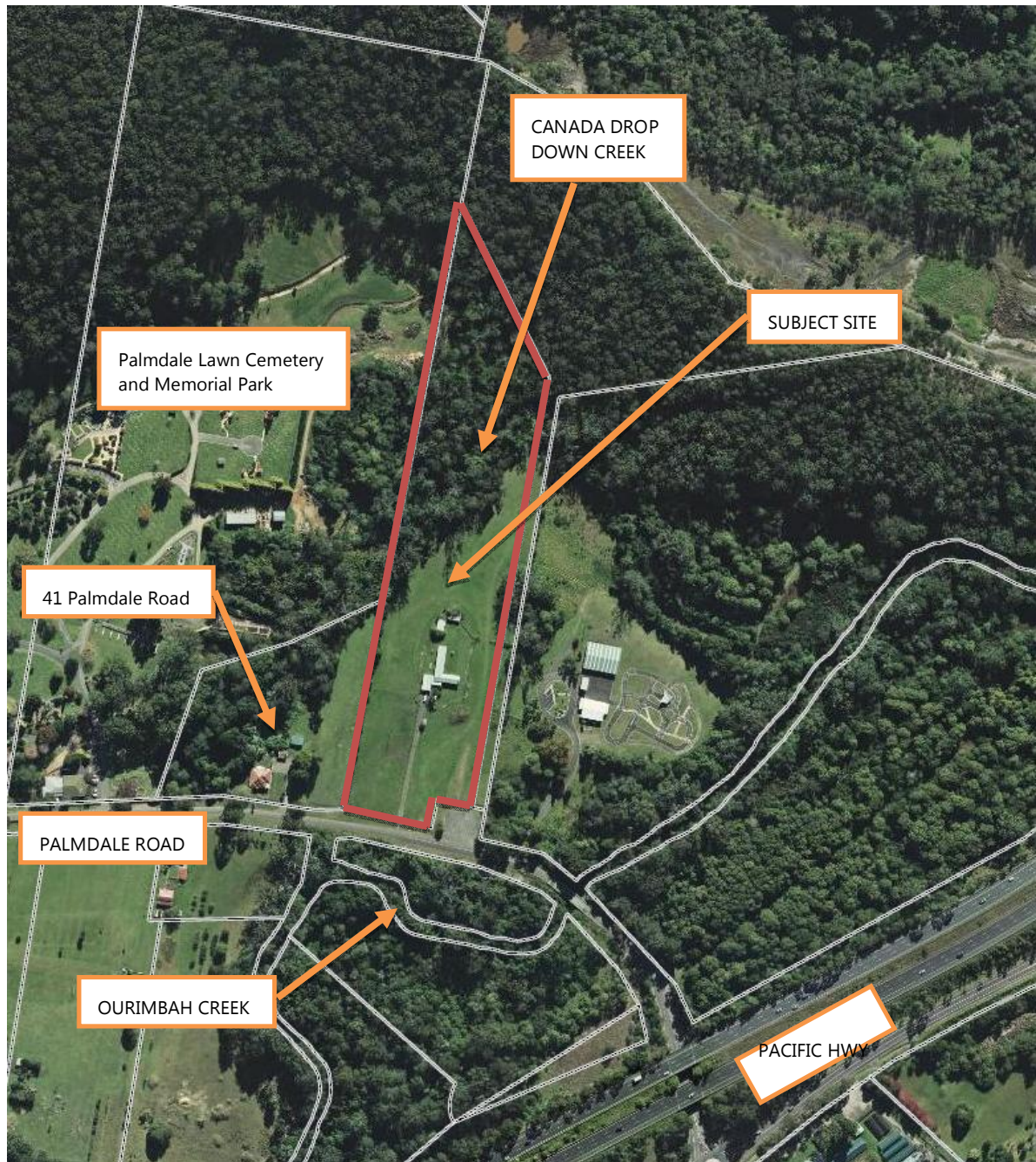


Figure 1: Site Locality Plan

2.0 FLOOD CONDITIONS

Consultation has been undertaken with Wyong Shire Council in order to obtain flood information relative to the subject site. Below is a summary of the information obtained from the Ourimbah Creek Catchment Flood Study (October 2013).

Site Flood Condition Summary: The subject development site experiences flooding from the north via Canada Drop Down Creek and from the south via Ourimbah Creek. The central ridge line through the site remains flood free for all events up to and including the 200 year ARI flood. Palmdale Road to the east and west of the site will be cut for events greater than 5 year ARI magnitude.

Flood Levels:

Table 1 shows relevant approximate flood levels adjacent to the site for various flood events. Refer to Appendix B for the flood level and velocity maps.

Table 1: Approximate flood levels adjacent to the site for various flood events.

Flood Event (ARI)	Canada Drop Down Creek (RL mAHD)	Ourimbah Creek (RL mAHD)
5 year	12.4	12.9
10 year	12.7	13.0
20 year	12.9	13.7
100 year	13.5	14.2
200 year	14.0	14.5
PMF	17.9	17.9

NOTE: Flood levels approximated from flood contours Figures 20-26.22, Ourimbah Creek Catchment Flood Study (2013)

Provisional Flood Hazard Category: The Provisional Flood Hazard Category map for the site shows high hazard conditions exist across the northern and southern ends of the site during the 1 in 100 year event. The broad ridge through the site is flood free for the 1 in 100 year event. High Hazard conditions exist across Palmdale Road to the east and the west of the site. Refer to Appendix C for the Flood Hazard Map.

Hydraulic category: The site is subject to floodway conditions across its northern and southern extents for the 1 in 100 year event. The broad ridge through the centre of the site is flood free for the 1 in 100 year event. Floodway conditions exist across Palmdale Road to the east and the west of the site for the 1 in 100 year event.

Refer to Appendix D for the 100 year Hydraulic Category map.

Emergency Response Classification and Road Overtopping Details: Table 2 shows the Emergency Response Classification for the site for various flood events. Refer to Appendix E for the Emergency Response Classification Maps.

Table 2: Emergency Response Classification for the site for various flood events

Flood Event (ARI)	Emergency Response Classification
5 year	Area with Overland Escape Route
100 year	Area with Overland Escape Route
PMF	High Trapped Perimeter Area

The Floodplain Risk Management Guideline (DECC 2007) provides the following definitions for the classifications relevant to the subject site:

- Areas with Overland Escape Route are those areas where access roads to flood free land cross lower lying flood prone land. Evacuation can take place by road only until access roads are closed by floodwater. Escape from rising floodwater is possible but by walking overland to higher ground. Anyone not able to walk out must be reached by using boats and aircraft. If people cannot get out before inundation, rescue will most likely be from rooftops.
- High Trapped Perimeter Area - The inhabited or potentially inhabited area includes enough land to cope with the number of people in the area that is higher than the limit of flooding (i.e. above the PMF). During a flood event the area is isolated by floodwater and property and may be inundated. However, there is an opportunity for people to retreat to higher ground above the PMF within the area and therefore the direct risk to life is limited. The area will require resupply by boat or air if not evacuated before the road is cut. If it will not be possible to provide adequate support during the period of isolation, evacuation will have to take place before isolation occurs.

The Ourimbah Creek Catchment Flood Study defines the response required for the Emergency Response Classifications as per Table 3 below.

Table 3: Response Required for Different Flood ERP Classifications (DECC Floodplain Risk Management Guideline)

Classification	Response Required		
	Resupply	Rescue/Medivac	Evacuation
High Flood Island	Yes	Possibly	Possibly
Low Flood Island	No	Yes	Yes
Area with Rising Road Access	No	Possibly	Yes
Area with Overland Escape Routes	No	Possibly	Yes
Low Trapped Perimeter	No	Yes	Yes
High Trapped Perimeter	Yes	Possibly	Possibly
Indirectly Affected Areas	Possibly	Possibly	Possibly
Not Flood Effectuated	No	No	No

3.0 DCP COMPLIANCE

The Wyong Local Environment Plan defines the Land Use Category – **6: Commercial and Industrial Uses**

Compliance with the relevant flood planning controls for Commercial and Industrial Uses from the DCP (2013) are addressed in the tables below.

*Table 4: Compliance with **Section 4.0 General Requirements** of the DCP (2013)*

	Requirement	Met Y/N	Comment
Requirements for Fencing	Fencing is to be constructed in such a manner that it will not modify the flow of floodwaters or cause damage to surrounding land.	N/A	Proposal does not include any fencing.
Requirements for Car Parking	The proposed car park should not increase the risk of vehicle damage by flooding inundation.	Y	Any proposed future car parking areas will be constructed on high ground with a suitable evacuation route to Palmdale Road.
	The proposed garage/car park should not increase the likelihood of flooding on other developments, properties or infrastructure.		
	Any damage that may arise to the proposed garage/car park shall not be greater than that which can be reasonably managed by the property owner.		
	Any damage that may arise to the proposed garage/car park shall not be greater than that which can be reasonably managed by the property owner.		
Requirements for Filling of Flood Prone Land	Filling for any purpose (including the raising of a building platform in flood-prone areas) is not permitted in areas identified as Flood Planning Precinct 3 or Flood Planning Precinct 4, unless a Floodplain Risk Management Plan for the catchment has been adopted which allows filling to occur. In all other areas, filling will not be permitted unless a report from a suitably qualified engineer has been submitted and approved by Council that certifies that the development will not increase flood affectation elsewhere.	Y	Minor earthworks are proposed within the low-lying land at the site frontage to create an ornamental wetland area. No net filling is proposed and works will be carried out to ensure no increase in flood affectation elsewhere.

	Filling of individual sites in isolation, without consideration of the cumulative effects is not permitted. Any proposal to fill a site must be accompanied by an analysis of the effect on flood levels of similar filling of developable sites in the area. This analysis would form part of a flood study prepared by a suitable qualified professional.	Y	Minor earthworks are proposed within the low-lying land at the site frontage to create an ornamental wetland area. No net filling is proposed and works will not influence adjacent flood levels.
Requirements for On-Site Sewer Management	The treatment tank/ holding device is to be located above the 1% AEP flood contour.	N/A	Proposal does not include any on site sewer management.
	The land application area is to be above that 5% AEP flood contour except in Wyong Shire's drinking water catchment where no component of the system will be permitted on land below the 1% AEP flood contour.		
	Refer to Chapter 3.8 – On Site Effluent Disposal in Non-Sewered areas for guidance with regard to this form of application.		
Requirements for Storage of Hazardous Materials	The storage of products which, in the opinion of Council, may be hazardous or pollute floodwaters, must be placed at a minimum of 500 mm above the height of the 1% AEP flood or placed within an area protected by bunds or levees such that no flood waters can enter the bunded area if the flood level rose to a level of 500 mm above the height of the 1% AEP flood.	N/A	Proposal does not include any storage of hazardous materials.

Table 5: Compliance with **Appendix D Detailed Assessment Criteria** of the DCP (2013)

	Requirement	Met Y/N	Comment
Compatibility with established Flood Hazard / Flooding Impacts and Behaviour	The development is compatible with the established flood hazard of the land. In areas where flood hazard has not been established through previous studies or reports, the flood hazard must be established in accordance with the Floodplain Development Manual.	Y	Advice from Council: <i>"Part of the site is high hazard & floodway. The site is considered to be Flood Planning Precinct 3 under the Prescriptive Controls Matrix for other floodplains in Appendix F of DCP 3.3 Floodplain Management. So on face value this property would be unsuitable for all of the land uses shown in the controls matrix. However as only part of the site is affected by the 1% AEP event, the property requires a performance based assessment."</i> This report forms a qualitative performance based assessment.
Impact on other land / Cumulative Effects of the Development	The development will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties.	Y	The only future works proposed within the floodplain are works within the low lying area at the frontage of the site to Palmdale Road. It is understood that earthworks within this area are minor in nature so as to not affect the behaviour of flood flows.
Manage Risk to Life	The development incorporates appropriate measures to manage risk to life from flood	Y	The proposed future works on site are removal of the existing dwelling and installation of memorial stones. Road access will be provided from the neighbouring lot to the west (31 Palmdale Road) and will be above the 100 year ARI flood level. Occupation of the site will generally be restricted to working hours during the daytime, which generally facilitates greater awareness of flood conditions on Palmdale Road i.e. staff/visitors will be using Palmdale Road to enter and exit the site throughout the day, and during heavy rainfall this will enable monitoring of evacuation conditions. Access to the site at night will be restricted and therefore the risk to life is removed outside working hours. Overall, by removing the residential dwelling, it is considered that the risk to life is positively impacted by the development.

Warning and Evacuation	The development is to have suitable effective warning time and reliable access for evacuation	Y	Refer to Section 4.2 below.
Environmental Impacts	The development will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses	Y	Any works within the existing low lying area at the site frontage are to be undertaken in accordance with standard sediment and erosion control practices. No native vegetation is proposed to be removed.
Cost to Community	The development is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding	Y	Any economic/social costs arising from flood damage can be reasonably managed by the property owner.
Ecological Sustainable Development	The development is consistent with the principles of Ecologically Sustainable Development	Y	The environmental impact of the proposed development is not considered to be significant in terms of flooding.
Climate Change	The development adequately considers the impact of climate change	Y	Appropriate benchmarks based on the best available current information have been used in producing the flood risk management studies and plans that inform this document.

4.0 FLOOD EMERGENCY MANAGEMENT PLAN

4.1. Flood Warnings

Consultation has been undertaken with the NSW State Emergency Service (SES) to ascertain the flood warnings available to residents and staff on Palmdale Road.

The Local SES unit is Wyong within the Sydney Northern region.

Due to the possible fast rise and fall nature of the flooding (i.e. for this catchment it can be within less than two hours), it is difficult for the SES to issue warnings based on river gauge and rainfall data. The SES have prepared the Wyong Shire Flood Emergency Sub Plan (2013). Refer to Appendix F for a copy of the plan.

The Wyong Shire Flood Emergency Sub Plan notes the following which is relevant to the subject site:

Collating Situational Information

- Ourimbah Creek Road is noted as a problem area which is monitored by SES during possible flood situations.
- The **Bureau of Meteorology's** Flood Warning Centre provides river height and rainfall information, data is available on the website <http://www.bom.gov.au/nsw/flood/>.
- **Manly Hydraulics Laboratory** (a business unit within NSW Public Works) automated river watch system funded by the Office of Environment and Heritage. This system provides river height and rainfall readings for a number of gauges in the Wyong Shire Council area. Recent data from this system is available on the Manly Hydraulic Laboratory website: <http://www.mhl.nsw.gov.au>. A history of area floods is also available upon request via the website.
- **NSW Office of Water.** This office advises flow rates and rates of rise for the Ourimbah Creek, Wyong River and Jiliby Creek. Daily river reports containing information on gauge heights and river flows are available from the website: <http://waterinfo.nsw.gov.au/>
- **NSW SES** Sydney Northern Region Headquarters. The Region Headquarters provides information on flooding and its consequences, including those in nearby council areas (this information is documented in Bulletins, Situation Reports and Operational Updates).

Provision of Flood Information and Warnings

- **NSW SES** Wyong Local Headquarters operations staff will be briefed regularly so that they can provide information in response to inquiries received in person or by other means such as phone, email or fax.
- **Bureau of Meteorology Severe Thunderstorm Warning.** These are issued direct to the media by the Bureau when severe thunderstorms are expected to produce dangerous or damaging conditions, including flash flooding. Severe thunderstorms are usually smaller in scale than events covered by Flood Watches and Severe Weather Warnings.
- **Bureau of Meteorology Severe Weather Warnings for Flash Flooding.** These are issued direct to the media by the Bureau and provide a warning of the possibility for flash flooding as a result of intense rainfall. These warnings are issued when severe weather is expected to affect land based communities with 6 to 24 hours. Severe Weather Warnings may also include other conditions such as Damaging Surf, Dangerous Surf or tides, or Damaging Winds.
- **Bureau of Meteorology Flood Watches.** Flood Watches are issued by the Bureau to advise people of the potential for flooding in a catchment area based on predicted or actual rainfall. Flood Watches will be included in NSW SES Flood Bulletins issued by the NSW SES Sydney Northern Region Headquarters.
- **Bureau of Meteorology Flood Warnings.** The NSW SES Sydney Northern Region Headquarters will send a copy of Bureau Flood Warnings to the NSW SES Wyong Unit. On receipt the NSW SES Local Incident Controller will provide the NSW SES Sydney Northern Region Headquarters with information on the estimated impacts of flooding at the predicted heights for inclusion in NSW SES Region Flood Bulletins.
- **NSW SES Local Flood Advices.** The NSW SES Local Incident Controller may issue Local Flood Advices for locations not covered by Bureau Flood Warnings. They may be provided verbally in response to phone inquiries but will normally be incorporated into NSW SES Region Flood Bulletins.
- **NSW SES Flood Bulletins.** The NSW SES Sydney Northern Region Headquarters will regularly issue NSW SES Flood Bulletins which describe information on the estimated impacts of flooding at the predicted heights (using information from Bureau Flood Warnings and NSW SES Local Flood Advices) to NSW SES units, media outlets and agencies on behalf of all NSW SES units in the Region.
- **NSW SES Evacuation Warnings and Evacuation Orders** These are usually issued to the media by the NSW SES Region Incident Controller on behalf of the NSW SES Local Incident Controller.
- The **RMS Transport Infoline** will provide advice to callers on the status of major roads. The RMS website also lists road closure information.
- **Wyong Shire Council** will provide information on the status of local roads.

4.2. Evacuation Conditions

The development site is not subject to flooding for events up to and including the 1 in 200 year flood. Therefore, in most situations evacuation is not essential, as remaining on site during the flood will not cause risk to life or property.

The primary evacuation route is via Palmdale Road to the east towards Pacific Highway. Palmdale Road is cut to the east by events greater than the 5 year ARI.

Depending on rainfall intensity, and the rate of rise of floodwaters, the time to inundation of the road will vary considerably. It is therefore recommended that the information presented in Section 4.1 be reviewed during conditions that may potentially cause flooding. It is advisable that the site is evacuated when it appears flooding of Palmdale Road is likely.

In significant flood events where Palmdale Road to the east is cut by floodwaters, the secondary evacuation route to high ground is via the proposed access through 41 Palmdale Road, west along Palmdale Road and southbound along Footts Road.

Councils Emergency Response Classification Maps indicate that the subject site is classified as an *Area with Overland Escape Route* for events up to the 1 in 100 year flood. If Palmdale Road has been cut by floodwaters and evacuation has not been undertaken, then safe evacuation to high ground is available by heading west along Palmdale Road, and south along Footts Road. Footts Road generally rises to the south to ground levels above the level of the PMF. It should be noted that Footts Road only allows evacuees to high ground above possible flood water. It does not allow evacuees to leave the area.

Evacuation along Palmdale Road to the west of Footts Road is not recommended. Evacuating in this direction will put evacuees at further risk as there are several locations along Palmdale Road to the west that are susceptible to high hazard flood conditions. Furthermore, Palmdale Road to the west does not provide access to support/facilities during major flooding.

In any case, it is recommended that no person ever walk, ride or drive through flood waters.

4.3. Site Flood Emergency Response Plan

Be Aware	• During prolonged or intense rainfall Palmdale Road is prone to flooding. • Monitor adjacent flood levels and if inundation of Palmdale Road appears imminent, evacuate the property via the driveway and Palmdale Road to the Pacific Highway before floodwaters cut the road. • You should maintain an Emergency Kit containing a battery powered radio, spare batteries, torch, first aid kit and emergency contact details for use in the event of a flood.
Prior to an Imminent Flood	• When heavy storms or significant rainfall are forecast: ◦ Keep an eye on Bureau of Meteorology flood warnings for this area. ◦ Tune your radio to the local ABC station for emergency broadcasts. • If directed to evacuate, follow Palmdale road to the EAST toward Pacific Highway (motorway). Refer to Evacuation Management Plan for details. • Ourimbah Creek and Canada Drop Down Creek are subject to flooding that may occur in as little as 1 to 2 hours during heavy rainfall. These events may cause flash flooding resulting in a rapid rise in floodwaters. • Advise staff/visitors who may be due to arrive during the flood that they should stay away from the area until further notice. • Locate emergency kit and have it ready.
During a Flood	• Never drive, ride or walk through floodwater. • For emergency help in floods and storms call SES on <u>132 500</u>. • If evacuation was not undertaken, seek refuge within the premises. The building is at a level above predicted 1:200 year flood level, and it will therefore take an extreme event to cause flooding of the building. • In the unlikely event that the building becomes inundated, remain in the building until SES have contacted the occupants and further advice has been sought. • Keep listening to emergency radio broadcasts. • Follow advice of emergency services.
After a Flood	• Never drive, ride or walk through floodwater. • Wait for storm to finish and flood water to recede before leaving building. • Keep listening to emergency radio broadcasts. • Follow advice of emergency services. • After floodwaters have receded: ◦ Take photographs of flood marks and damaged areas, and prepare insurance claim for damaged areas (subject to insurance terms) ◦ Arrange for utilities to be inspected and repaired by qualified trades people ◦ Arrange for cleaning and repair of flood affected areas • Restock and replace your emergency kit

4.4. Evacuation Plan

A site specific evacuation plan is included in this report at Appendix F. A summary of evacuation priorities and actions under specific conditions is given in Table 6.

Table 6: Evacuation Priorities and Actions during a flood

Priority	Flood Situation	Action
1	Palmdale Road not cut to east of site, floodwaters rising within Ourimbah Creek or SES advise 'evacuate'	Evacuate east along Palmdale Road to Pacific Highway
2	Palmdale Road to east of site is flooded, flooding of subject site at 31/41 Palmdale Road not likely	Remain on site, or follow SES advice
3	Palmdale Road to east of site is flooded, flooding of subject site at 31/41 Palmdale Road appears likely	Evacuate along Footts Road to south to high ground (note that evacuees may be stranded on Footts Road until floodwaters recede), or follow SES advice.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This report has reviewed available flood information, assessed the compliance of the proposed development with respect to the DCP (2013), and identified suitable evacuation requirements.

The development site itself is partly flood free for events up to and including the 200 year ARI flood. The evacuation route from the site (Palmdale Road) is subject to flooding for events greater than the 5 year ARI flood.

Due to the potential rapid rise of floodwater at this location, it is advised that information regarding flooding is obtained in accordance with the NSW SES Wyong Shire Flood Emergency Sub Plan.

Evacuation when required should proceed in accordance with the Evacuation Management Plan.

The rezoning of the land including consideration of the future site development is not considered to increase risk to property or life from flooding.

6.0 REFERENCES

1. *Ourimbah Creek Catchment Flood Study*, Catchment Simulation Solutions, October 2013
2. *Floodplain Risk Management Guideline*, NSW Government Department of Environment and Climate Change, October 2007
3. *Wyong Shire Development Control Plan*, Wyong Shire Council, 2013
4. *Wyong Shire Flood Emergency Sub Plan*, NSW SES, April 2013