21 March 2025 REF: WTJ22-323

Adam Richardson
Manager, Development Assessment – North Team
Northern Beaches Council
1 Belgrave Street
Manly NSW 2095

RE: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION – DA2024/1079

PROPERTY AT 53, 53A AND 53B WARRIEWOOD ROAD, WARRIEWOOD

Dear Adam,

Reference is made to DA2024/1079 which seeks development consent for community title subdivision into five (5) lots and civil works at 53, 53A & 53B Warriewood Road, Warriewood (the Subject Site).

Table 1 overleaf provides a response to the matters raised by Northern Beaches Council (Council) on 29 November 2024 in the formal request for additional information and on 21 February 2025 via email. This response is supported by the following information:

- **Appendix 1** – Building Envelope Plan;
- **Appendix 2** – Subdivision Plan;
- **Appendix 3** – Civil Engineering Plans;
- **Appendix 4** – Pheasant Place Community Associate Owners Consent;
- **Appendix 5** – Council Correspondence – Road Reserve Width;
- **Appendix 6** – DRAINS Model;
- **Appendix 7** – Flora and Fauna Assessment;
- **Appendix 8** – Community Management Plan;
- **Appendix 9** – Stormwater Report;
- **Appendix 10** – Flood Assessment;
- **Appendix 11** – Landscape Plans;
- **Appendix 12** – Water Cycle Management Options;
    - A) Proprietary filter cartridge system with below ground tanks;
    - B) Raingarden & Wetland options; and
    - C) OSD & vegetated swale (proposed option).

Should you wish to discuss further, please contact Cameron Gray on 0477003429 or via email at cgray@willowtp.com.au.

Yours Faithfully,

Chris Wilson
Managing Director
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TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
Request for Additional Information dated 29 November 2024	
1. Dwelling Density *The submitted plans demonstrate non-compliance with clause 6.1 of Pittwater Local Environmental Plan 2014 (PLEP 2014). Clause 6.1(3) requires that the total number of dwellings shown opposite that buffer area, sector or address in Column 2 of that table will be erected. Presently the development only provides the opportunity for 28 dwellings to be erected. Based on the Urban Release Area Map -Sheet URA_012 a minimum of 17 dwellings would be required for 53A Warriewood Road and a minimum of 13 dwellings would be required for 53B Warriewood Road. The proposal currently demonstrates a shortfall of 2 dwellings to achieve compliance with clause 6.1 of PLEP 2014.*	Three (3) secondary dwellings will be provided to achieve the minimum dwelling requirements pursuant to Clause 6.1 of the *Pittwater Local Environmental Plan 2014* (PLEP2014). It is noted that any future DA which seeks to subdivide the Subject Site further would be required to achieve compliance. Nonetheless, it is noted that a revised Building Envelope Plan has been provided in **Appendix 1** which demonstrate that the proposed subdivision layout is capable of being subdivided further to deliver compliant dwellings. The proposed development intends to deliver the Subject Site in three (3) stages: ▪ DA2024/1847 submitted 15 January 2025 (9 dwellings); ▪ Super lot 2 – to be lodged April 2025 (9 dwellings); and ▪ Super lot 3 – to be lodged May 2025 (14 dwellings).
A building envelope plan should be provided to demonstrate that the future redevelopment of the land which will occur as separate applications will be able to meet the minimum requirements provided by section D16 Warriewood Valley Locality of Pittwater 21 Development Control Plan (DCP). Noting that inference has been made to lots accommodating more than one dwelling on the site. Should the proposed development fail to comply with the aforementioned DCP requirements, the development will also fail to achieve compliance with clause 6.1 of PLEP 2014 which is a prerequisite to the issuing of development consent.	The Building Envelope Plan provided in **Appendix 1** demonstrates that the proposed subdivision will satisfy the minimum 32 dwelling target for the Subject Site inclusive of the 53 Warriewood Road land parcel which attributes to the additional dwelling. Despite a residential lot being removed from south side of Lorikeet Grove, this is compensated on the northern side with the addition of a secondary dwelling. Further, the Building Envelope Plan demonstrates that the future dwellings are capable of achieving compliance with the relevant requirements of Section D16 Warriewood Valley Locality of the Pittwater 21 Development Control Plan (PDCP21). Should the secondary dwellings be conditioned to the earmarked sites the this could be an option to appease Council of the certainty of the delivery of these dwellings, noting that any future DA which seeks to subdivide the Subject Site further would be required to achieve compliance.
The proposal includes land for residential purposes identified as Lot 2 and Lot 4, within the 25m private riparian corridor, which is prohibited under clause 6.1(3) of PLEP 2024. Additionally, the creation of future residential land within the riparian corridor is also inconsistent with Warriewood Valley Strategic Review Addendum Report (2018), Warriewood Valley Release Area Landscape	A revised Subdivision Plan is provided in **Appenidx 2** which has removed Lot 2. All dwellings and garages are located outside of the creek corridor. Boundary fencing and landscape areas for the proposed Lots 4 & 5 result in a minor

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
Masterplan and Design Guidelines (2018) and section D16 of the DCP. As such, Lot 2 and Lot 4 must be amended accordingly.	encroachment of the outer creek line corridor. This is consistent with the approved developments in Warriewood Valley, including Lorikeet Grove. The proposed front boundary of the proposed Lots 4 & 5 is dictated by the contour of Lorikeet Grove, the required verge and residential boundary of No. 21 Lorikeet Grove and No 2 Ibis Place, Warriewood. The proposal represents in fill development to link and continue the extension of Lorikeet Grove west and east of the Subject Site. The dwellings referenced above are also located in the outer creek line corridor and have been previously approved on this basis and set existing precedence. Enforcing strict compliance in this instance would result in an inconsistent subdivision pattern and reduced streetscape outcomes as the future dwellings would be required to be setback considerably from those approved to the north. A condition of consent may be imposed which requires that no built form is undertaken within that area, with the exception of the front fencing and landscaping.
2. Acid Sulfate Soils *The proposed development includes cut to a depth of 2m within 500m of adjacent Class 3 and 4 land that is below 5 metres Australian Height Datum. The applicant has not demonstrated that the works will not lower the watertable by 1m. An acid sulfate soils management plan should be provided to support this DA as required by clause 7.1 of PLEP 2014.*	As confirmed in the Civil Engineering Plans provided in **Appendix 3**, the proposed excavation will not exceed 2m in depth and as such, an Acid Sulfate Soils Management Plan is not required to be provided.
3. Subdivision *The subdivision plans and accompanying documentation demonstrate that Lot 1 'Future Public Reserve' will occupy an area of 3,980m2 to be provided to Council. Only land measured 25m from the centreline of the creek, known as the inner creekline corridor can be provided to Council as provided by Warriewood Valley Contributions Plan, unless a Voluntary Planning Agreement (VPA) occurs for additional land as regulated by Part 7 Division 7.1*	It is requested that the inner creek line corridor be dedicated to Council. The outer creek line corridor will remain in private ownership as part of the Community Title land. An updated Subdivision Plan is provided in **Appendix 2** which shows the exact location of the residential allotments in relation the corridors and location of the proposed shared pathway. The inner creek corridor line is confirmed as a future public reserve on the plan.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
Subdivision 2 of the Environmental Planning and Assessment Act 1979. As such, an updated subdivision plan is required showing: ▪ *Extent of the inner 25m creek line corridor as the only section of creek line land to be dedicated to Council.* ▪ *The exact location of residential allotments (Lot 2 and Lot 4) in relation to the inner and outer 25m creek line corridor.* ▪ *Location of shared pathway demonstrating its connection to the approved pathway on either side (attached).*	The location of the shared pathway continues and adjoins with the approved share path location at the northern boundary adjoining 53C Warriewood Road, as approved under development consents N0330/14 and N0027/16.
4. Staging *DA2024/1079 seeks to undertake the subdivision works in two separate phases, with most of the infrastructure required to ensure the subject site and land to the south of Lorikeet Grove (proposed Lot 1) can connect to the surrounding road network to be undertaken as Phase 2.*	Staging of the proposed development is provided in the Subdivision Plan provided in **Appendix 2**. Phase 1 of the proposed development shows the demarcation of Lorikeet Grove which will be the first phase to ensure the delivery of the public infrastructure prior to the development of the internal roads, extension of Pheasant Place than the redevelopment of the residential lots.
Council requires infrastructure works such as the delivery of Lorikeet Grove and works to Pheasant Place to be delivered under Phase 1 to ensure that future residential development on this site has full vehicular ingress/egress connecting to the surrounding road network.	Phase 2 of the proposed developments provides the extension of Pheasant Place and proposed Road 01 & 02 which will be delivered prior to any residential development to ensure the development has full vehicular ingress/egress connecting to the surrounding road network. The intention to build Lorikeet Grove first will ensure there will be access to the Subject Site and most importantly existing residents in Pheasant Place during the delivery including construction.
5. Creekline Corridor *The documentation detailing the creekline corridor is insufficient and does not meet the requirements provided by C-1, C-2, C-3, C-4 of Warriewood Valley Landscape Masterplan and Design Guidelines (WVLMDG) and Warriewood Valley Urban Land Release Water Management Specification 2001. Amended documentation is required to respond to these requirements along with the following information:* ▪ *Detailed engineered plans are to be submitted with the application depicting the creek construction.*	The proponent has reviewed and provided updated design and documentation to demonstrate compliance with C-1, C-2, C-3 and C-4 in the revised Civil Engineer Plans (**Appendix 3**). Refer to amended Civil DRG. C05.01 and C05.11 for updated creekline embankment and rehabilitation works. The appropriate battering and rock armouring proposed is in accordance with the Warriewood Valley Landscape Masterplan Design Guidelines (WVLMDG). ▪ C-1: Design complies with C-1 by: Providing pedestrian/cycleway path above the 20% AEP flood level, incorporating native vegetation or revegetation within the affected inner/outer Creekline corridor; ▪ C-2: Design complies with C-2 by: Providing pedestrian/cycleway above the 20% AEP level (although cannot be located between inner 25m and

TABLE 1 – RESPONSE TO COMMENTS	
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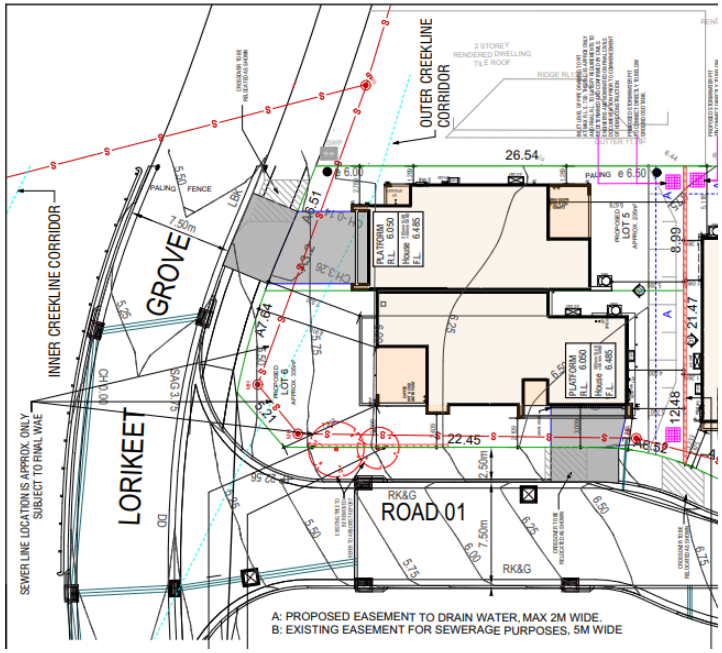
	outer 25m due to this requirement and revegetating the creekline with native aquatic species in accordance with WVLMDG; ▪ C-3: Design complies with C-3 by: incorporating aquatic planting for water quality and Fauna habitat, providing appropriate rock terracing/armouring at embankments, maintaining pedestrian/cycleway above the 20% AEP levels; and ▪ C-4: Design complies with C-4 by: incorporating natural rock armouring and terracing elements along creek embankment, incorporating aquatic planting for water quality and Fauna habitat, and introducing natural rockwork to proposed drainage outlet and swale.
▪ *Retention of remnant native vegetation along creekline corridors or otherwise.*	Native vegetation will be retained where possible. There is an existing retaining wall located along the creek embankment which is to be removed, and levels lowered, to allow for additional flood storage through the inner and outer creek line corridor. The creek embankment is proposed to be reinstated with a 1 in 3 batter and rock armouring as per WVLMDG. This is shown on the revised Civil Engineering Plans provided in **Appendix 3**. All proposed vegetation within the inner/outer creek line corridors will be to Council's specifications.
▪ *Creekline corridor rehabilitation program to restore the creekline to a 'natural watercourse', including extensive stands of casuarina glauca, groves of eucalyptus robusta with other native feature trees.*	The Flora and Fauna Assessment (**Appendix 7**) shows the current low diversity an abundance of native species within this creek line corridor area. The proposed planting as per the VMP submitted with the DA will see an increase in native font diversity cover and connectivity. The VMP includes planting which incorporates both She Oaks and Swamp Mahogany trees in the inner 25m at a density that is typical of natural creek line corridors of this type. Canopy trees are combined with mid and understory native species. The edge closest to the waterway as robust riparian wet edge species particularly Gahnia as this provides both habitat and top of bank stability.
▪ *Creekline interface such as details of boulder retaining walls instead of sheer block walls or steep batters.*	Retaining walls are not required along the creek line. Bank stabilisation works, including rock armouring, is proposed at a max. grade of 1V in 3H as per WVLMDG.
▪ *Detail about how the proposed excavation will connect to the creek is required including any bank stabilisation measures.*	Revised Civil Engineering Plans are provided in **Appendix 3** which have amended the creek line embankment works. Specifically, it is proposed to reinstate the creek line embankment and provide rock armouring for a significant portion of the creek within the Subject Site. Further details of the works will be provided as

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
	part of the Subdivision Works Certificate. No retaining walls are proposed along the length of the creek.
▪ *The floodplain area located downstream of the main stormwater outlet line is to be designed to mitigate floodplain erosion and provide a stable connection to the creek, and should be designed in accordance with section 4.4.4 Creek Design Requirements of the Warriewood Water Management Specification.*	Refer to the revised Civil Engineer Plans provided in **Appendix 3**, drawings DRG. C05.01 and C05.11, for updated creekline embankment works and revised location of stormwater outlets. Appropriate scour protection for the trunk drainage outlet will be provided at A01-01. Reference shall also be made to the revised Flood Assessment provided in **Appendix 10**. .
▪ *The electrical substation is not permitted within the outer creekline corridor.*	The substation has been relocated outside the outer Creekline corridor. Refer updated engineering plans presented in **Appendix 3**.
▪ *The 2.5 metre wide sharepath located within the outer creekline corridor must be located above the 20% AEP flood level and must adjoin with the existing approved sharepath location(s) on adjoining allotments.*	As shown on the revised Civil Engineering Plans provided in **Appendix 3**, the 2.5m wide shared path has been relocated to extend parallel to Lorikeet Grove, connecting to the north and south. The path will be located above the 20% AEP. It is noted that shared paths do not currently exist within the neighbouring developments however we have aligned the pathways to accord with the relevant approvals. Works beyond the Subject Site boundary are expected to be undertaken by other parties.
▪ *Residential accommodation is not permitted within the creekline corridor.*	All dwellings and garages are located outside of the creek corridor. Boundary fencing and landscape areas for the proposed Lots 4 & 5 result in a very minor encroachment of the outer creek line corridor. This is consistent with the approved developments in Warriewood Valley, including Lorikeet Grove. The proposed front boundary of the proposed Lots 4 & 5 is dictated by the contour of Lorikeet Grove, the required verge and residential boundary of No. 21 Lorikeet Grove and No 2 Ibis Place, Warriewood. The proposal represents in fill development to link and continue the extension of Lorikeet Grove west and east of the Subject Site. The dwellings referenced above are also located in the outer creek line corridor and have been previously approved on this basis and set existing precedence. Enforcing strict compliance in this instance would result in an inconsistent subdivision pattern and reduced streetscape outcomes as the future dwellings would be required to be setback considerably from those approved to the north.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
	The built form Development Application under DA2024/1847 was lodged with Council on 15 January 2025 and shows no habitable built form proposed in outer creekline corridor as shown in extract below.  A condition of consent may be imposed which requires that no habitable built form is undertaken within that area, with the exception of the front fencing and landscaping.
6. Landscape *The landscape plans are to be updated to include the following information:*	The Landscape Plans (**Appendix 11**) have been updated to reflect Council's requested information including: ▪ 2.5m wide shared path above 20% AEP flood level;

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▪ *The 2.5 metre wide sharepath shall be continuous across the outer creekline corridor and adjoin with the approved share path location at the northern boundary adjoining 53C Warriewood Road. The sharepath must be above the 20% AEP flood level.* ▪ *The inner and outer creekline corridor is to be clearly documented identifying the 25m inner and 25 metre outer zones, to identify any residential lot encroachments that are not permitted.* ▪ *The electrical substation location within the outer creekline corridor is not supported.* ▪ *A 2.1m wide footpath along Warriewood Road and shall be shown including street tree planting and must align with adjoining properties.* ▪ *A 1.5m wide footpath to one side of Lorikeet Grove shall be shown including street tree planting. Notwithstanding street tree planting is required to both sides of Lorikeet Grove in accordance with the Warriewood Valley Landscape Masterplan and Design Guidelines, August 2018.* ▪ *The proposed 2.5m shared path south of Lorikeet Grove needs further clarification to ensure it connects with existing and planned paths on adjacent lots, creating a continuous path network.*	▪ The inner and outer creekline corridor overlay with further detail of tree species provided in the updated VMP; ▪ The substation is located outside of the creek line corridor and west of Lorikeet Grove; ▪ A 2.1m footpath along the Warriewood Road is provided including street planting consistent with WVLMDG aligning with adjoining neighbours; ▪ A 1.5m wide footpath is integrated along Lorikeet Grove; and ▪ The proposed share path connects with that approved under development consents N0330/14 and N0027/16 at 53C Warriewood Road.
7. Owner's Consent *This proposal seeks to provide vehicular access to and from residential Lots 3, 4, and 5 via Pheasant Place and will also extend Pheasant Place. As Pheasant Place is privately owned by multiple parties, consent is required from each owner to grant legal access for the development and to permit the proposed roadwork.*	The proponent is working with the Pheasant Place Community Association 270946 to raise Positive Covenant for 'Waste Services Vehicles' and obtain owners consent for the development. See attached letter from the Pheasant Place Community Association (**Appendix 4**).
8. Engineering <u>*Road Network*</u> ▪ *The development is to be amended to provide vertical faced kerb and gutter for internal roads, identified as Road 1 and Road 2.*	Lorikeet Grove currently incorporates kerb and gutter (vertical face). The internal road network known as Roads 01 and 02 are private and have to date incorporated roll kerb and gutter. Regardless, all roads have now been updated to incorporate kerb and gutter. Refer to the revised Civil Engineering Plans provided in **Appendix 3**. Laybacks for the future driveways are also proposed to be constructed now to avoid demolishing and reconstructing under the future house builds.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
▪ *All footpaths must be increased to a width of 1.5m to be consistent with AS1428.2 and the Warriewood Valley Roads Masterplan (WVRM).*	1.5m wide footpaths consistent with AS1428.2 and the Warriewood Valley Roads Masterplan is provided in the revised Civil Engineering Plans provided in **Appendix 3**.
▪ *The Lorikeet Grove road reserve is to be amended to a width of 16m to match the width approved on the adjacent site at 53C Warriewood Road.*	The Lorikeet Grove road reserve currently matches the 16m road reserve on the adjacent 53C Warriewood Road. It is proposed to transition to a 15.25m road reserve within the Subject Site. Enforcing strict compliance in this instance would result in an inconsistent road connection of Lorikeet Grove. Correspondence from Council confirming acceptance of such is provided in **Appendix 5**.
▪ *The proposed 2.5m shared path south of Lorikeet Grove needs further clarification to ensure it connects with existing and planned paths on adjacent lots, creating a continuous path network. Updated plans should illustrate this connectivity.*	The 2.5m wide shared path has been relocated in the Civil Engineering Plans provided in **Appendix 3** to extend parallel to Lorikeet Grove, connecting to the north and south. The path will be located above the 20% AEP. It is noted that shared paths do not currently exist within the neighbouring developments. Works beyond the Subject Site boundary are expected to be undertaken by other parties.
▪ *Provide detailed design of internal roads (Road 1, Road 2, Lorikeet Grove and part of Pheasant Place).*	Detailed design of all proposed internal roads is provided in the revised Civil Engineering Plans provided in **Appendix 3**.
Bus Bay & Parking Bay *The Warriewood Valley Development Contributions Plan Amendment 16, Revision 3 envisages a bus shelter being provided on Warriewood Road between Manooka Place and Alameda Way (item 5.5). The indented bus stop proposed under this DA would be an appropriate location for this bus shelter noting that there are no bus shelters currently in place on the northbound side of Warriewood Road within reasonable proximity of the development. Detailed designs for both indents including provision of a bus shelter and the related parking restriction signposting will require separate approval under a Roads Act approval application. Notwithstanding the traffic concept plans for signposting of the subdivision are to be updated to have the bus stop signposted as Bus Zone rather than No Stopping.*	Updated idented bus bay and parking bay designs, including associate pavement and signage, are shown in the revised Civil Engineering Plans provided in **Appendix 3**. Please note there is insufficient space to include both the indented bus bay and the shelter. If a shelter is required, then the indented bay will need to be removed. This detail will need to be considered in consultation with Council to confirm arrangement and optimal outcome. It is noted that all proposed works on Warriewood Road will be subject to a separate s138 application process and will be confirmed as a condition of consent. Additional details will also be provided during the Subdivision Works Certificate stage.
Streetlighting *Details of streetlighting is to be provided on the DA plans to ensure lighting infrastructure does not interfere with other key services or landscaping.*	Indicative street light locations are now presented on the revised Civil Engineering Plans provided in **Appendix 3**. Note the electrical design is ongoing and will be subject to change through detailed design phase of the development.

<table>
<tr><th colspan="2">TABLE 1 – RESPONSE TO COMMENTS</th></tr>
<tr><th>Comment</th><th>Response</th></tr>
<tr><td>Lighting must be provided for the shared path south of Lorikeet Grove on any sections which deviate from away from the Lorikeet Grove road alignment.</td><td>Lighting on or adjacent to Pheasant Place is not proposed as this is private land under the Pheasant Place Community Association.</td></tr>
<tr><td><u>Onsite Stormwater Detention (OSD)</u>

▪ A DRAINS model is required to be submitted to Council to demonstrate compliance with the requirements of the Warriewood Valley Stormwater Management Specification 2001 and Councils Water Management for Development policy.</td><td>A revised DRAINS Model is provided in Appendix 6 which aligns with recent drainage changes and demonstrates compliance with the requirements of the Warriewood Valley Stormwater Specification 2002 and Council's Waste Management for Development Policy</td></tr>
<tr><td>▪ Post-development peak flows both from the sector and in the channel at the downstream boundary of each sector are not to exceed the pre-development flows for the full range of duration's and frequencies up to the 1%AEP level plus climate change.</td><td>The post-development peak flows are less than the pre-development peak flows for each sector. Refer to the updated Stormwater Management Report (Appendix 9) and revised Civil Engineering Plans (Appendix 3).</td></tr>
<tr><td>▪ During the preparation of the Water Management Report for the sector a model is to be established that:
– matches the peak sector outflow discharge to the pre-development condition of the sector within ± 5% of the peak reported in Appendix A – shows the pre-development hydrograph and the developed hydrograph with the tail cut at the duration of the storm
– the developed hydrograph is to be no more than ± 10% of the pre-development hydrograph at any location on the rising or falling limb. All stormwater volume control structures and detention basins are to be above the1%AEP flood levels. (Note that Water Quality control ponds can be below the1%AEP flood level, but are to be above the 20% AEP flood level but wholly within the private buffer zone - See Section 4.5, Table 4.3 and Section 4.3.2).</td><td>With reference to Warriewood Valley Urban Land Release Water Management Specification, the Subject Site is located in sector 4. Appendix A of the specification requires the following SSR for the sector is 368m³/ha.
PSD requirements for the sector varies depending on storm duration.
A3 Site Storage Requirement

The results of this analysis, considering sector groups (generally on a catchment basis) are provided in Table A.1.

Table A.1: Site Storage Requirements, SSR (m³/ha) - Based on 1%AEP 1 Hour Critical Storm

<table>
<tr><th>Sectors</th><th>SSR (m³/ha)</th></tr>
<tr><td>1,2,3,4,5,6,7,C,D</td><td>368</td></tr>
<tr><td>8,9</td><td>400</td></tr>
<tr><td>10</td><td>366</td></tr>
<tr><td>11,12</td><td>488</td></tr>
<tr><td>14</td><td>519</td></tr>
<tr><td>15</td><td>457</td></tr>
</table>
Note: Sectors 17 and B are unlikely to be further developed and have therefore been omitted.</td></tr>
</table>

TABLE 1 – RESPONSE TO COMMENTS

<table>
<tr><th>Comment</th><th>Response</th></tr>
<tr><td></td><td>
Table A.2: Permissible Site Discharge for Base Case (Rural Conditions)
<table>
<tr><th rowspan="2">Sector</th><th rowspan="2">Area (ha)</th><th colspan="2">1%-30min</th><th colspan="2">1%-1hr</th><th colspan="2">1%-2hr</th><th colspan="2">1%-3hr</th><th colspan="2">1%-6hr</th></tr>
<tr><th>Peak Q (m^3/s)</th><th>PSD (l/s/ha)</th><th>Peak Q (m^3/s)</th><th>PSD (l/s/ha)</th><th>Peak Q (m^3/s)</th><th>PSD (l/s/ha)</th><th>Peak Q (m^3/s)</th><th>PSD (l/s/ha)</th><th>Peak Q (m^3/s)</th><th>PSD (l/s/ha)</th></tr>
<tr><td>1</td><td>16.90</td><td>1.767</td><td>105</td><td>3.142</td><td>186</td><td>3.331</td><td>197</td><td>2.948</td><td>174</td><td>3.070</td><td>182</td></tr>
<tr><td>2</td><td>4.44</td><td>0.624</td><td>141</td><td>1.012</td><td>228</td><td>1.037</td><td>234</td><td>0.806</td><td>182</td><td>0.900</td><td>203</td></tr>
<tr><td>3</td><td>8.13</td><td>0.460</td><td>57</td><td>1.002</td><td>123</td><td>1.207</td><td>148</td><td>1.142</td><td>140</td><td>1.254</td><td>154</td></tr>
<tr><td>4</td><td>12.79</td><td>1.180</td><td>92</td><td>2.031</td><td>159</td><td>2.118</td><td>166</td><td>1.849</td><td>145</td><td>1.934</td><td>151</td></tr>
<tr><td>5</td><td>3.62</td><td>0.831</td><td>229</td><td>1.199</td><td>331</td><td>1.411</td><td>390</td><td>1.010</td><td>279</td><td>0.850</td><td>235</td></tr>
<tr><td>6</td><td>2.28</td><td>0.300</td><td>132</td><td>0.533</td><td>234</td><td>0.540</td><td>237</td><td>0.430</td><td>189</td><td>0.477</td><td>209</td></tr>
<tr><td>7</td><td>3.02</td><td>0.225</td><td>75</td><td>0.471</td><td>156</td><td>0.535</td><td>177</td><td>0.498</td><td>165</td><td>0.516</td><td>171</td></tr>
<tr><td>8</td><td>13.04</td><td>1.521</td><td>117</td><td>2.386</td><td>183</td><td>2.538</td><td>195</td><td>1.857</td><td>142</td><td>2.139</td><td>164</td></tr>
<tr><td>9</td><td>17.08</td><td>1.737</td><td>102</td><td>3.412</td><td>200</td><td>3.448</td><td>202</td><td>3.031</td><td>177</td><td>3.347</td><td>196</td></tr>
<tr><td>10</td><td>14.08</td><td>1.967</td><td>140</td><td>3.032</td><td>215</td><td>3.163</td><td>225</td><td>2.356</td><td>167</td><td>2.655</td><td>189</td></tr>
<tr><td>11</td><td>8.25</td><td>0.242</td><td>29</td><td>0.505</td><td>61</td><td>0.768</td><td>93</td><td>0.837</td><td>101</td><td>0.860</td><td>104</td></tr>
<tr><td>12</td><td>17.27</td><td>1.052</td><td>61</td><td>2.092</td><td>121</td><td>2.507</td><td>145</td><td>2.384</td><td>138</td><td>2.634</td><td>152</td></tr>
<tr><td>14</td><td>7.94</td><td>0.263</td><td>33</td><td>0.629</td><td>79</td><td>0.864</td><td>109</td><td>0.899</td><td>113</td><td>0.937</td><td>118</td></tr>
<tr><td>15</td><td>16.08</td><td>0.805</td><td>50</td><td>1.836</td><td>114</td><td>2.126</td><td>132</td><td>2.037</td><td>127</td><td>2.240</td><td>139</td></tr>
<tr><td>17</td><td>11.09</td><td>0.189</td><td>17</td><td>0.453</td><td>41</td><td>0.741</td><td>67</td><td>0.851</td><td>77</td><td>0.948</td><td>85</td></tr>
<tr><td>B</td><td>5.23</td><td>0.112</td><td>21</td><td>0.232</td><td>44</td><td>0.371</td><td>71</td><td>0.442</td><td>84</td><td>0.464</td><td>89</td></tr>
<tr><td>C</td><td>1.85</td><td>0.135</td><td>73</td><td>0.261</td><td>141</td><td>0.298</td><td>161</td><td>0.280</td><td>151</td><td>0.306</td><td>165</td></tr>
<tr><td>D</td><td>8.30</td><td>1.148</td><td>138</td><td>1.880</td><td>226</td><td>1.911</td><td>230</td><td>1.554</td><td>187</td><td>1.703</td><td>205</td></tr>
</table>
The peak flow sector outflow discharge will be achieved and will be provided in the revised calculations. Refer to the updated Stormwater Management Report (Appendix 9) and revised Civil Engineering Plans (Appendix 3).
The pre-development hydrograph can be extracted from Flood Assessment (Appendix 10) results for the sector.

The post-developed hydrograph at the downstream section of the Subject Site can be extracted from flood modelling results for the sector.

The below ground OSD tanks are established at levels at or above the expected 1% AEP flood levels. Due to the Subject Site being largely flood affected the location of the detention tanks are located within the private roads. Water quality components are aslo located above the relevant flood levels.
</td></tr>
<tr><td>▪ A stormwater quantity management assessment of the of the pipe drainage and OSD measures is to form part of an overall Water Management report and be prepared by a RPEng or NER Civil qualified engineer who has extensive experience in hydrological modelling and hydraulic design.</td><td>Compliance with the certification requirements are detailed in the Stormwater Report provided in Appendix 9.</td></tr>
</table>

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
▪ *Full engineering plans are to be provided not conceptual minimum on site detention/stormwater drainage details are to be provided in accordance with section 9.7.3 of Councils Water Management for Development Policy.*	Additional OSD/stormwater details have been provided in detailed in the Stormwater Report provided in **Appendix 9** and revised Civil Engineering Plans provided in **Appendix 3**.
Hydraulic details and upgrade of Council's existing stormwater line (53 Warriewood Road) ▪ *A DRAINS model must be provided for the upstream catchment in accordance with Councils Water Management Policy for Development and Auspec One using an initial loss continuing loss Hydrological model as required by Australian Rainfall and Runoff 2019. The DRAINS model is also to incorporate Climate change increases as recommended in ARR 4.2 and the Warriewood Valley Water Management Specification 2001 to determine peak stormwater flows.*	A DRAINS Model is provided in **Appendix 6** which includes the upstream catchment extents as well as the subdivision network. Climate change factors have also been included in the revised DRAINS model and design, in accordance with AR&R 4.2. The DRAINS model has been updated to incorporate relevant rainfall multiplier of 1.27. The multiplier is in accordance with AR&R4.2 and considers the Shared Socioeconomic Pathway scenario SSP2-4.5, target 2050 climate change period.
▪ *The existing 600m RCP Council stormwater line is be upgraded accordingly to a minimum capacity 1/100 AEP plus Climate change. An RCP pipeline is to be specified and Sydney Water cover requirements on their main sewer line are to be incorporated into the design.*	The post-development peak flows are less than the pre-development peak flows for each sector. Refer to the updated Stormwater Management Report (**Appendix 9**) and revised Civil Engineering Plans (**Appendix 3**).
▪ *The stormwater upgrade details are to include an energy dissipater structure at the end of the line which is compatible with the final creek works design.*	The revised Civil Engineering Plans in **Appendix 3** demonstrate the proposed scour protection measures. Additional construction detailing (rock sizing, fabric/material specifications, etc.) is subject to future detailed design.
▪ *A stormwater drainage long section incorporating a Hydraulic Grade Line Analysis is to also provided with the amended engineering plans.*	The proposed trunk drainage design for the line located parallel to the southern boundary is now presented in the revised Civil Engineering Plans provided in **Appendix 3**.
▪ *Council's stormwater line which crosses Warriewood road is also to be upgraded to a minimum capacity 1/100 AEP plus Climate change capacity and appropriately upgraded /new inlet pits provided in Warriewood road, Pit blockage factors are to be in accordance with Auspec one and used in the DRAINS model.*	As part of the proposed trunk drainage augmentation works, it is proposed to upgrade the existing DN600 crossing to a DN900. New inlet pits are also proposed in Warriewood Road to capture overland flow. It is confirmed that a linear drain could also be implemented within the proposed parking bay in lieu of the kerb inlet pits.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
	The DRAINS model has been updated (**Appendix 6**) to incorporate rainfall multiplier of 1.27. The multiplier is in accordance with AR&R4.2 and considers the Shared Socioeconomic Pathway scenario SSP2-4.5, target 2050 climate change period. Pit blockage factors have been applied. It is confirmed that the proposed drainage upgrades are adequate and supported by the Flood Assessment provided in **Appendix 10**.
▪ *An appropriately sized overland flow path is to be provided over Councils upgraded stormwater line within the site the cater for all flows in excess of the 1/100 AEP storm events. A velocity vrs depth assessment is to be provided in accordance with the NSW Flood Risk Management Guideline.*	A minimum easement width of 3m has been adopted in accordance with Section 6.1.1.1.1 of Council's Water Management for Development Policy.
9. Flooding *The Flood Study and Water Management Report are inadequate and need to be appropriately updated. Specifically, the Flood Study and modelling needs to be amended to assess the proposal against:* ▪ *The flood modelling must consider the proposed development as detail within the civil engineering plans.* ▪ *The flood modelling and mapping must consider the whole development site.* ▪ *The model must account for the development across the other side of the creek at 6 - 10 Macpherson Street.* ▪ *The flood modelling needs to be updated to reflect all of the proposed development, and modelling for the existing case needs to be updated to reflect existing conditions for the numerous nearby properties.* ▪ *The flood requirements in the Warriewood Valley Urban Land Specification, including modelling the 20% AEP flood event.* ▪ *Clause 5.21 of PLEP 2014 must be addressed.* ▪ *Clauses C6.1, B3.11, and B3.12 of the DCP must be addressed.* ▪ *Consideration of climate change must be included within the results.* *The flood modelling must be based on from the Ingleside, Elanora and Warriewood Overland Flow Flood Study (IEW OFFS). If this is not utilised, this must be justified. Rainfall should be based on ARR 2019 rainfall patterns.*	The following comments are provided: ▪ The Flood Assessment provided in **Appendix 10**, prepared by Catchment Simulation Solutions (CSS), has been prepared and reflects the latest site survey and proposed design terrain. ▪ The flood modelling and mapping now reflects the whole development site, and surrounds; ▪ 6-10 Macpherson Street is already reflected in the IEW model that is being used for this assessment; The proposed development has been incorporated in the post development assessment. Existing conditions cannot be updated to reflect other, recently approved, developments as no design terrain is available. However, given that previous works would not be able to produce adverse impacts, flood behaviour should remain consistent with existing conditions. Note: If design terrain can be provided for these recent developments, it can be incorporated; ▪ Flood requirements of the Warriewood Valley Urban Land Specification are adhered to and the 2yr, 5yr, 20yr, 100yr and PMF events have been run. Note: ARR1987 is being adopted, and therefore we are not running 50%AEP, 20%AEP, but running 2yr ARI and 5yr ARI instead; ▪ Clause 5.21 of PLEP2014 has been addressed;

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
Mapping should be provided that shows the locations of inner and outer creek corridors, the basin, building footprints, and the relevant design flood extents, all superimposed.	▪ Clause 6.1, B3.11 and B3.12 of the DCP has been addressed; and ▪ Climate change will be considered by application of year 2100 sea level rise, and 30% increase in rainfall as part of the simulations. ▪ As above, the IEW model is being used on this assessment, including the use of ARR1987 (ARR2019) is not being used as the hydrologic model is not fit for this purpose, with significant updates required to make it suitable). Inner and outer creek corridors will be mapped, together with any basins, buildings, and design flood extents.
10. Water Management *The proposal stormwater quality management system is relying primarily on proprietary stormwater filtration cartridges which is inconsistent with C6.1 of the DCP. To meet the requirements of C6.1 of the DCP, additional vegetated treatment measure must be included in the water treatment chain. A wetland or bio-filtration system is to be included within the private buffer strip (outer riparian corridor) to promote ecological outcome and infiltration.*	The wetland and/or bio-retention system scenarios have been tested and are not feasible for this development. Flooding outcomes from the assessment are summarised in **Table 2** below. Proprietary filter cartridges within the OSD tanks, pit filter baskets within the private roads, and an end of line vegetated swale is to be utilised for achieving Council pollutant reduction targets. Refer to the updated engineering plans and stormwater management report for details.
The Water Management Report provided with this DA must be updated to include the information within each of the relevant sections of this letter and must be updated to reflect the works proposed under this DA.	Refer to the revised Stormwater Report provided in **Appendix 9**.
11. Biodiversity *The Flora and Fauna Assessment (Kingfisher 2024) does not provide a suitable assessment of the biodiversity values of the subject site or the potential impacts of the proposal. Inconsistent information is provided in relation to the survey effort, the latest vegetation mapping of the site, the agreement (or otherwise) of the type and extent of PCTs found on site based on site assessment conducted, there is no assessment against the requirements of the SEPP, PLEP 2014 or DCP, and the report does not provide clear conclusions. The plans provided within the report are inconsistent with the application as submitted. The creekline corridor, consisting of the inner 25m public riparian zone and outer 25m private riparian corridor, need to be depicted and described, and the recommendations focus on the protection and*	The Flora and Fauna Assessment provided in **Appendix 7** has been updated to include: ▪ A more detailed assessment of the Subject Site's Biodiversity Values. This includes information on survey effort, extent, target species, survey methods. Vegetation mapping includes review of the SVT mapping – accessed Jan 2025 and the original Sydney Metro mapping. Mapping was verified and amended based on on-ground surveys including detailed examination of areas of native canopy and potential native understory. Data has been compiled from 3 surveys undertaken 2022 to 2024. Including spring, summer and winter seasons with additional surveys in Oct 2022, March 2023, and Dec 2024. Assessment of the current (2025) proposed works on the sites biodiversity has been under taken noting the main area of increased detail is in the proposed creek-bank works.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
rehabilitation of the biodiversity values of this area. Accordingly, the report must be updated to consider these matters. *These inconsistencies carry through into the draft Vegetation Management Plan (VMP) provided. A revised VMP is to be prepared that applies to the inner 25m public riparian zone only, with a Landscape Plan to apply to the outer 25m private riparian corridor area. The subdivision design is to ensure that the outer 25m riparian corridor complies with the controls, and is to be retained in private ownership and is to perform the functions of part water quality control and a fauna/flora corridor. The private buffer strip is to be a multifunctional corridor, appear to be part of the public domain, and may contain water quality control ponds or the water quality treatment measures, and/or roads and other impervious areas traditionally sited in the public domain, for up to 25% of the outer Creekline Corridor area subject to merit assessment. The extent of excavation and proposed uses within the creekline corridor may not be supported.*	▪ The inner 25m and outer 25m are depicted and described. The engineering team have worked with the ecologist in an effort to retain native trees on the bank. Numerous iterations of designs have been trialed to avoid impact. No design that avoids tree removal fulfilled the flood storage capacity requirements. Minimising impact has been applied throughout the 25m zone. native trees still require removal. Seed has been collected (and more will be). This local seed is being used to propagate trees to be planting back into this area. The seed collection and planting are part of the Mitigation measures. In the case of the creekline bank it has not been possible to avoid impact and remove the existing vertical wall or create the necessary levels drop in levels. The process of Avoid, minimise, mitigate in included in the Biodiversity Report. Recommendations are detailed in the VMP as this is the tool to have the diversity and abundance of native species returned. VMP: *The VMP applies to the inner 25m public riparian zone only, and cross references with the Landscape Plan that applies to the outer 25m private riparian corridor area. The full focus of the inner 25m is the re-created of the full strata vegetated zone. The species are from the required list in the DCP and additional locally native species observed growing naturally within 500m of the site and within the relevant PCT. The Ecologist and Landscape Architect have cross-referenced works to have continuity of the ecological values across the inner and outer 25m zones. The VMP proposed implementation has included consideration into the maintenance of this inner zone as this will become Councils at some time.*
12. Community Management Plan *The community management plan is to be updated and provide details on the maintenance schedule, including funding for maintenance of the private infrastructure (water management facilities, outer 25m creek line corridor land, internal roads 1 and 2, and Pheasant Place) proposed as a part of this development including details in the event of conflict.* *The community management plan is to be updated to include a positive covenant for waste services to be provided within the community road lot of*	The Community Management Statement (CMS) has been updated to include the matters identified by the Council including right of Council for Council Waste Colelction. **(Appendix 8).** The Positive Covenant for Pheasant Place Community Association will be placed on their title through NSW Land Registry Services therefore separate process than the CMS.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
Pheasant Place and the property at Pheasant Place. Additionally, the community management plan must contain a clause that considers "Council Waste Collection".	
13. Sediment and Erosion Control Plan *The proposed Sediment and Erosion control plan is insufficient to demonstrate site erosion mitigation during the various development stages. An amended sediment and erosion control plan is required with consideration of the earthworks staging and revegetation activities.*	The Sediment and Erosion Control measures shown in the Civil Engineering Plans provided in **Appendix 3** are in accordance with Managing Urban Stormwater: Soils and Construction – Volume 1 (The Blue Book). The location of the sediment basin has been located within the outer Creekline corridor and within the downstream portion of the site to ensure construction runoff can be captured effectively. Revegetation of the proposed inner and outer creekline corridors has been considered as part of the overall sediment and erosion control plan. The sediment basin has also been located downstream of all proposed roadways and residential lot areas and is expected to remain in place until all stages of the works have been completed.
Email Correspondence dated 21 February 2025	
1. *Lot 2 is not supportable, another position elsewhere on the site needs to be found. No residential lot west of Lorikeet Grove will be supported. It is my view that the subdivision geometry can be augmented to provide for the requisite number of Lots within the main area of the subdivision.*	A revised Subdivision Plan is provided in **Appenidx 2** which has removed Lot 2 and provides no residential land south of Lorikeet Grove. The proposal offers 31 dwellings consisting of 28 residential lots and 3 secondary dwellings to satisfy the density requirement as represented in the Building Envelope Plan **(Appendix 1)**.
2. *It is necessary to relocate the wetland so that no part of it is positioned within the inner riparian corridor. Any wetland that forms part of the development is to be positioned within the outer riparian corridor only. However, and notwithstanding this, where a wetland is located within the outer riparian corridor, its design and position is not to have an adverse impact on the flood storage, as required by the DCP.*	Refer to **Table 2** below. By way of update, Enspire (Civil) in consultation with CSS (Flooding) have tested both the wetland and raingarden scenarios and advise that flood behaviour AND flood storage would be significantly impacted. Refer to **Appendix 12**, sketch SK0019 [Raingarden layout] and SK0023 [Wetland layout] for details. CSS confirmed that by incorporating the wetland, adverse flooding impacts were being reported within the mainstream area due to the elevated terrain within the wetland. The elevated terrain is required to design the wetland was a major contributor to the increases in flood levels and adverse flood behaviour. The wetland (or raingarden) essentially acts as an impediment to flow. An image extracted from the preliminary wetland / flood scenario is shown below.

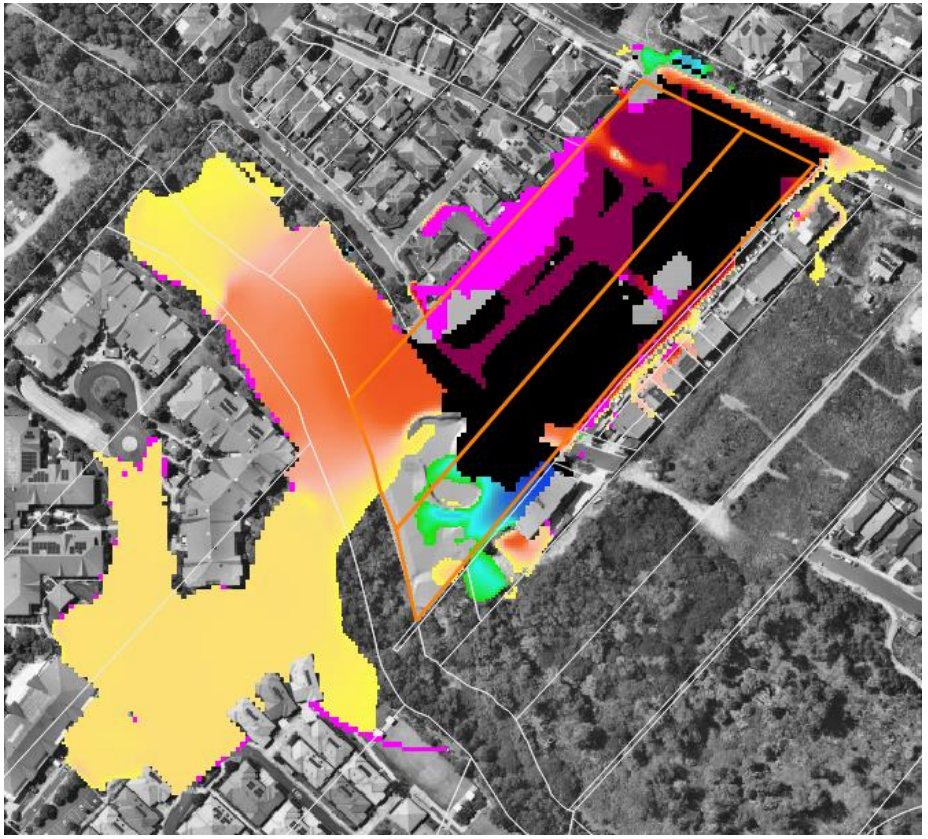
TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
	 Due to site constraints, i.e., required location and levels of Lorikeet Grove, location of existing sewer carrier mains within the inner/outer creek line corridors, location of existing trunk drainage main, limited area available for 'flood storage', and the requirement to have lots located above the relevant flood levels, it is therefore not

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
	feasible for a wetland to be incorporated into the Subject Site. The Subject Site is so heavily constrained that complying with all DCP requirements simultaneously is not possible.
3. *If wetland is not feasible, a bioretention system within the outer riparian corridor may be the next option.*	Similar to the above and from a flooding perspective, incorporating a raingarden or wetland are not feasible for this development. Refer **Table 2**.
4. *Where a wetland and biofiltration system is not feasible due to flooding, a further option that may be viable includes stormfilter cartridges that are incorporated into the OSD that is positioned within the private road. To get the necessary Water Sensitive Urban Design outcomes, the discharge from the stormfilter system would need to be connected to a long-vegetated swale or bio-wetland in the outer riparian corridor, potentially in the form of the below:*	Installing proprietary filter cartridges within the OSD tanks is the preferred approach. As stated in the comments prior, the proponent in unity with engineer (Enspire) and flood engineer (CSS) have tested both the wetland and raingarden scenarios, and by locating either within the outer Creekline corridor creates significant issues from a flooding behaviour, extents and levels perspective. The flood study results also indicate flood levels would remain relatively high in relation to the required wetland/raingarden levels, thereby inundating the infrastructure in frequent storm events. Enspire have updated the stormwater outlet configuration for the Subject Site as demonstrated on C05.01 of **Appendix 3**. As requested, all flows from the subdivision network will now extend through a vegetated swale downstream of the outlet. The vegetate swale will also cater for flows resulting from the trunk drainage line. Sizing of the swale will be subject to further assessment in detailed design. As outlined in the sections above, we will require the full extent/area west of Lorikeet Grove for flood storage. Incorporating any form of wetland or bio-retention system will hinder flooding outcomes due to capacity constraints. Note the vegetated swale is proposed over any form of bio-wetland due to the limited area available and requirement for flood storage. Regardless, a form of 'naturalised treatment' has now been incorporated. Vegetation within the swale will also comply with Council's specifications.

TABLE 1 – RESPONSE TO COMMENTS	
Comment	**Response**
5. *Notwithstanding point 4 above, anything that creates resistance to the flow in the riparian corridor will impact flood behaviour. The DCP requires that development does not cause adverse flood impacts on surrounding properties. Flood levels are not permitted to increase by more than 0.02m in the 1% AEP event or by more than 0.05m in the PMF event. Flood velocities are not permitted to increase by more than 10% in the PMF event. All events are to factor in climate change.*	It is agreed that any components proposed within the riparian or flood storage area is likely to impact flood behaviour. The works within the inner and outer creek line corridors have been revised to consist entirely of 'flood storage' only as shown in the revised Civil Engineering Plans provided in **Appendix 3**. No obstructions are proposed other than what currently exists there.
To reduce adverse flood impacts, excavation and digging down within the creek may assist. However, the available native vegetation mapping shows patches of the endangered ecological community Coastal Flats Swamp Mahogany Forest in the creek area. The submitted Flora and Fauna Assessment (Kingfisher 2024) did not provide a suitable assessment of the biodiversity values of the subject site or the potential impacts of the proposal. The inner creek line corridor should be fully vegetated, and this would include the retention of any remnant vegetation such as these trees. The area is also mapped as a Coastal Wetland Proximity area (SEPP Resilience & Hazards), the lowering of ground levels to reduce adverse flood impacts may have a detrimental impact to the adjoining mapped Coastal Wetland. That would then cause the development to be designated development.	The inner creek line corridor will be fully vegetated. Vegetation along the inner creek-line corridor includes native and exotic canopy trees, all other strata are exotic. Efforts to design for trees retention have not resulted in the ability to retain trees and batter the bank. If small areas are left at a different substrate height, they will be eroded more rapidly than adjoining areas and the bank, and other future plantings compromised. While tree planting does not equate to the retention of mature trees another solution has not been found despite efforts. If Council have suggestions that could achieve the tree retention and other design criteria the VMP and design can be updated. An assessment under SEPP Resilience & Hazards for the Coastal Wetland (Warriewood wetland) indicates no impact that would trigger designated development. The following were assessed with the available information: dewatering, weed impacts, pollution directly overland or via ground water, separation on connectivity, possible changes in groundwater levels. Noting that much of the Warriewood Valley Land release area is within the local floodplain and the water-table is generally elevated, such as where the wetland is, it can be assumed that the 'WWV' and the wetlands have contiguous ground water. Changes in this one area will not impact the wetlands. The cumulative impact of the many changes to the creek line corridor and the decreased capacity for slow percolation of water in through porous vegetated areas is acknowledged. The proposed development is therefore not deemed to be designated development.
7. The provision of the shared path in the riparian corridor – will need to be positioned in the outside of the riparian corridor and additionally the shared pedestrian path is to be aligned with the existing shared pedestrian paths at Pheasant Place and north to the existing Lorikeet Road reserve.	The proposed 2.5m wide share path is located within the outer creek line corridor and continues to adjoin with the approved share path location as the northern boundary adjoining 53C Warriewood Road, as approved under development consents N0330/13 and N0027/16. Furthermore, no shared path works beyond the site boundaries are proposed.

TABLE 2 – WATER CYCLE MANAGEMENT STRATEGY OPTIONS		
Option / Solution	**Civil Engineering Assessment**	**Flooding Outcomes**
(A) **OSD & Water Quality Tanks (No Wetland / Raingarden)** – *Initial DA Submission*	Solution was submitted to Council under the initial DA lodgement. Works involved construction of 2 below ground OSD and water quality tanks, and the provision of flood storage within the inner/outer creekline corridors. Residential Lot 2 was also proposed under the submission. No wetland or raingarden components were proposed under the initial submission. Both OSD and water quality measures located above expected flood levels, operating to intended purpose. Consideration was given to downstream water quality components, however it was not the adopted approach because of existing flood extents and levels within the site being high.	Flooding outcomes initially relied on the Craig and Rhodes Water Management Report (2019). Council has since confirmed this is no longer applicable and cannot be relied upon. Catchment Simulation Solutions have since been engaged to prepare the relevant flood study and reporting for the Subject Site using Council's flood model undertaken in accordance with the relevant flood assessment requirements.
(B) **Wetland / Raingarden Solution** – *Based on discussions with Council*	This solution is consistent with what was presented in December's meeting with Council. Enspire agreed to work through a wetland / raingarden solution within the downstream Creekline corridor, provided flooding outcomes could be achieved. The proposed strategy that was agreed in principle involved: ▪ Introducing an additional crest within Lorikeet Grove which then resulted in 2 'sags' in the road. Existing road levels maintained to the north and south (within existing developments); ▪ Proposed wetland infrastructure similar to that presented in SK0023. Refer SK0023 for an indication which was issued to Council; ▪ Provision of a GPT upstream of the wetland, although inundated in various flood events; and ▪ Construction of a maintenance access ramp to the wetland.	CSS confirmed that by incorporating the wetland or raingarden **(Appendix 12**), adverse flooding impacts were being reported within the mainstream area due to the elevated terrain within the wetland. It was found that the wetland was a major contributor to increases in flood levels and adverse flood behaviour. The wetland or raingarden essentially acts as an impediment to flow. An image extracted from the preliminary wetland / flood scenario is shown below.

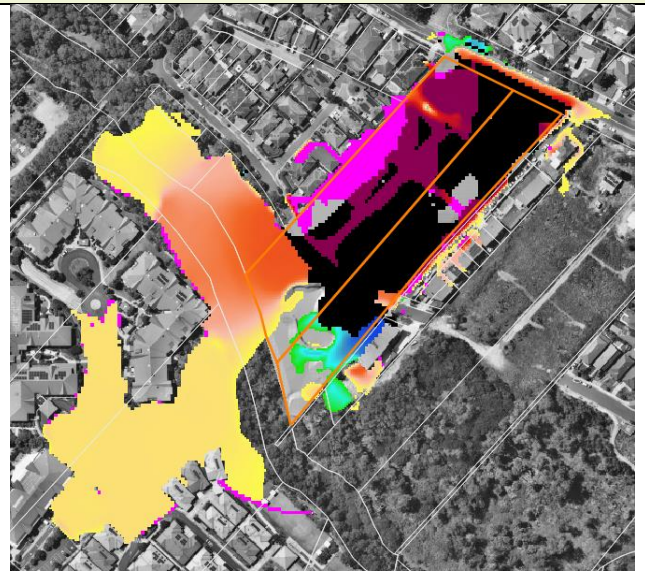
TABLE 2 – WATER CYCLE MANAGEMENT STRATEGY OPTIONS		
Option / Solution	**Civil Engineering Assessment**	**Flooding Outcomes**
	Enspire worked through the above strategy, including a revised 3D terrain model which was then assessed by CSS (Flooding) to determine flooding impacts. Refer column adjacent for outcomes. As a result of flooding outcomes (right), and due to site constraints, i.e., required location and levels of Lorikeet Grove, location of existing sewer carrier mains within the inner/outer creek line corridors, location of existing trunk drainage main, limited area available for 'flood storage', and the requirement to have lots located above the relevant flood levels, it is therefore not feasible for a wetland and raingarden to be incorporated into the Subject Site. The wetland or raingarden would also be inundated in majority of storm events.	
(C) **OSD, Water Quality Tanks and Vegetated Swale** – Current Design	Current solution presented on the revised Civil Engineering Plans (**Appendix 3**). The Water Management strategy reverts back to the original scheme presented in (A), although with the introduction of a vegetated swale within the outer Creekline corridor. The vegetated swale is proposed at the outlet of the drainage outlet. The water quality treatment train now consists of (i) Rainwater tanks (future house builds); (ii) Pit filter inserts within the road drainage pits (to remove gross pollutants); (iii) Proprietary water quality filter cartridges within the tanks, and (iv) Vegetated swale at the outlet.	The outcomes of the flood assessment adopting this water management strategy indicate that no adverse impact to flood level or velocity are predicted outside of the development site within the mainstream area of Narrabeen Creek in all flood events. It is noted that changes to flood behaviour are predicted on Warriewood Road as a direct result of frontage works and roadworks in this location, but these are not predicted to impact adjacent lots in all events up to and including the 100-year ARI (with climate change).

TABLE 2 – WATER CYCLE MANAGEMENT STRATEGY OPTIONS		
Option / Solution	**Civil Engineering Assessment**	**Flooding Outcomes**
	Enspire advise this to be the most viable solution with respect to site constraints & flooding requirements, whilst also addressing water quality requirements. It also ensures both OSD and water quality components are located above mainstream flood levels. The proposed option includes mechanical and naturalised system providing an integrated outcome to meet council flooding and water cycle management requirements.	