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Department of Water and Environmental Regulation
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To Whom it May Concern,

RE – Lots 13, 14 & 15 Forrest Beach Road, Wonnerup - Clearing Permit Application

Please find herein information pertaining to a clearing permit (area) application on behalf of Wonnerup Group Pty Ltd (herein referred to as the applicant).

Background

The applicant is seeking to develop a building envelope and associated infrastructure on Lots 13, 14 and 15 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 6.48 ha in size, with each individual lot being comprised of 2.16 ha. It is located in the municipality of the City of Busselton, approximately 8 kilometres (km) north of the Busselton Central Business District (refer to **Figure 1**).

The subject site is zoned 'Conservation' pursuant to the City of Busselton's *Local Planning Scheme No. 21*. Both 'Single House' and 'Home Occupation' are permitted uses within this zone. The subject site is currently utilised for cattle grazing.

The Malbup River is located approximately 100 m east of the subject site. This watercourse is associated with the Vasse-Wonnerup wetlands which is listed as a Wetland of International Importance under the Ramsar *Convention on Wetlands* and a Conservation Category (CC) wetland (UFI 15,214).

The proposed works within each Lot will entail the construction of a building envelope for a single residential dwelling. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling. The sand pad will be constructed to a height of 3.0 m Australian Height Datum (AHD), with this area comprising 1,000 m^2 (25 m x 40 m). With the addition of batters, the total footprint of the sand pad will be 2,000 m^2 (40 m x 50 m). An onsite effluent disposal area of 150 m^2 has been included within the 1,000 m^2 footprint.

For Lots 13 and 14, a joint 3 m wide driveway will traverse an area which is subject to seasonal inundation and therefore a box culvert (1,200 mm wide by 450 mm high) will be laid in the lowest lying part of the waterway. The construction of the driveway will require the clearing of approximately 500 m^2 of native coastal saltmarsh vegetation in 'Excellent' condition (refer to **Figure 2**). The building envelope within these Lots has been strategically located to avoid direct impacts to native vegetation.

For Lot 15, the proposed building envelope and driveway will directly impact approximately 2,010 m^2 of coastal saltmarsh vegetation in a 'Degraded' condition (refer to **Figure 2**). The configuration of the building envelope has been informed by the onsite flora and vegetation survey (Accendo 2020) to protect areas of increased environmental values, namely the coastal saltmarsh vegetation community threatened ecological community (TEC).

Flora and Vegetation

A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020 within the subject site. A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera (Accendo 2020) (refer to **Appendix A**).

No Threatened Flora pursuant to the *Biodiversity Conservation Act 2016* (BC Act) nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey (Accendo 2020).

During the flora and vegetation survey, vegetation within the subject site was described as cultivated pasture intersected by areas of the coastal saltmarsh vegetation community. The pasture grasses include **Lolium rigidum, *Avena barbata* and **Bromus diandrus.* Other exotic taxa in the pastured areas include **Solanum linnaeanum, *Ornithopus compressus, *Lotus subbiflorus* and **Romulea rosea* var. *australis* (Accendo 2020).

The coastal saltmarsh vegetation community within the subject site is dominated by *Salicornia quinqueflora*. Associated species include *Senecio condylus*, **Lolium rigidum*, a Chenopodiaceae species and another unidentifiable monocot species (Accendo 2020).

The coastal saltmarsh vegetation community within the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh' community, which is listed as a TEC under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019).

A key criterion to be considered part of the TEC is a continuous or intermittent saltwater influence. The Wonnerup surge barrier, which is located nearby and downstream of the subject site, prevents flooding of low-lying land during winter storms and restricts connection to the ocean during this period. However, fish gates are opened during summer to allow saltwater to enter the estuary to inhibit the formation of algal blooms (DWER 2018). During this period, the saltmarshes within the subject site are subject to some saltwater influences from the ocean.

The coastal saltmarsh vegetation community within the development footprint in Lots 13 and 14 is in 'Excellent' condition, with only a minor presence of weeds. Accordingly, the vegetation subject to clearing within these Lots constitutes the coastal saltmarsh vegetation TEC.

Conversely, the coastal saltmarsh community within the development footprint in Lot 15 is in a 'Degraded' condition due to the high degree of weed invasion (greater than 50%) and therefore this vegetation does not comply with the criterion for the coastal saltmarsh vegetation community TEC (refer to **Figure 2**).

Minimisation and Mitigation Measures

The configuration of the building envelopes and access driveways within Lots 13, 14 and 15 has been informed by the onsite flora and vegetation survey (Accendo 2020) to protect areas of increased environmental values, namely the coastal saltmarsh vegetation community TEC and the nearby Ramsar wetland.

In relation to Lots 13 and 14, the building envelopes have been positioned to avoid any direct impacts to the onsite TEC whilst also providing the greatest possible separation distance to the CC and Ramsar wetland. It is proposed to combine the driveway for Lots 13 and 14 to minimise the disturbance footprint within the TEC as far as practicable. There are no other alternative locations or options for the driveway.

The vegetation subject to disturbance required for the building envelope within Lot 15 does not contain any conservation significant flora or represent habitat critical for the survival of waterbirds, due to the high degree of weed invasion. As an avoidance mechanism, the building envelope has been setback as far as practicable to achieve an approximate 75 m setback to the onsite TEC.

It is considered that no other reasonable and practicable avoidance measures can be implemented to minimise the clearing footprint.

To avoid any potential indirect impacts to the TEC and CC wetland/Ramsar wetland, the applicant has committed to the following mitigation measures:

- Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
- Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and
- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands.

Impact Assessment

Any clearing of native vegetation requires a permit in accordance with Part V of the *Environmental Protection Act 1986* (EP Act), except where an exception applies under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing Native Vegetation) Regulations 2004*.

The proposed clearing footprint, in addition to the wetland area spanning from Peppermint Grove to West Busselton, is located within an Environmentally Sensitive Area (ESA). This mapping is attributed to the Vasse-Wonnerup wetland, a Ramsar and CC wetland.

The clearing of native vegetation for the purpose of the construction of driveways within Lots 13, 14 and 15, and the construction of a building envelope within Lot 15, will require an approved clearing permit. Clearing applications are assessed against the Ten Clearing Principles outlined in Schedule 5 of the EP Act. These principles aim to ensure that all potential impacts resulting from the removal of native vegetation can be assessed in an integrated manner.

An examination of the Ten Clearing Principles applied against a desktop investigation and site-specific investigations is provided below.

Table 1: Assessment against the Ten Clearing Principles.

Principle	Assessment	Conclusion
a.) Native vegetation should not be cleared if it comprises a high level of biological diversity	Mapping of vegetation complexes for the Swan Coastal Plain places the subject site within the Vasse vegetation complex, which is described as a mixture of the closed scrub of *Melaleuca* species, fringing *Eucalyptus rudis* – Melaleuca species woodlands, as well as tuart – jarrah – marri open forests. South of the Capel River, it also includes areas dominated by *Tecticornia* and *Salicornia* species (Webb *et al.* 2016). The *Swan Coastal Plain Vegetation Complex Statistics Report* (Webb *et al.* 2016) states that 4,924 ha of the complex remains, representing over 31% of its original pre-European extent with 13% protected in the reserve system. During the flora and vegetation survey, vegetation within the subject site was described as cultivated pasture intersected by areas of the coastal saltmarsh vegetation community. The pasture grasses include **Lolium rigidum, *Avena barbata* and **Bromus diandrus.* Other exotic taxa in the pastured areas include **Solanum linnaeanum, *Ornithopus compressus, *Lotus subbiflorus* and **Romulea rosea* var. *australis* (Accendo 2020). The pasture areas within the subject site are in 'Completely Degraded' condition. The coastal saltmarsh vegetation community within the subject site is dominated by *Salicornia quinqueflora*. Associated species include *Senecio condylus*, **Lolium rigidum*, a Chenopodiaceae species and another unidentifiable monocot species (Accendo 2020). The coastal saltmarsh vegetation community within the development footprint in Lots 13 and 14 is in 'Excellent' condition, with only a minor presence of weeds. Accordingly, the vegetation subject to clearing within these Lots constitutes the coastal saltmarsh vegetation TEC. Conversely, the coastal saltmarsh community within the development footprint in Lot 15 is in a 'Degraded' condition due to the high degree of weed invasion (greater than 50%) and therefore this vegetation does not comply with the criterion for the coastal saltmarsh vegetation community TEC (refer to **Figure 2**). Construction of the proposed driveway within Lots 13 and 14 will result in the removal of approximately 500 m^2 of the coastal saltmarsh vegetation community TEC/PEC. It is noted	While the proposed development will result in the removal of a small area of TEC/PEC, the vegetation association, fauna habitats and landform types present within the application area are well represented in surrounding areas (Accendo 2020; GIS Database). The application area is unlikely to represent an area of higher biodiversity than surrounding areas, in either a local or regional context, particularly in consideration of the historical and current land uses (livestock grazing). The proposed clearing is not likely to be at variance with this Principle.

Principle	Assessment	Conclusion
	that Lot 13 and 14 contain a combined total of 1.55 ha of the coastal saltmarsh vegetation community TEC which will not be impacted. The Threatened Species Scientific Committee (TSSC) provides information on the estimated extent of the coastal saltmarsh vegetation community TEC within Western Australia. An assessment of the significance of the proposed clearing of the TEC within local and regional scales was made by comparing the extent within the clearing footprint to that published for the community (TSSC 2013). The total extent of the coastal saltmarsh vegetation community TEC within Western Australia is estimated to be approximately 4,000 ha (TSSC 2013). The Swan Coastal Plain bio-geographic region contains the largest areas of saltmarsh vegetation in Western Australia. On a local scale, the Broadwater and Vasse-Wonnerup wetland system, comprised of 900 ha of core wetlands (excluding floodplains), has been mapped by Tingay and Tingay (1980) as containing saltmarsh vegetation associated with the TEC. Based on the above, the clearing of 500 m^2 of the coastal saltmarsh vegetation community TEC would result in a reduction of up to 0.0012% of the total estimated extent and less than 0.006% at a local scale. Within the subject site, this would equate to the removal of approximately 3% of the total extent of the coastal saltmarsh vegetation community TEC. In consideration of the extent of the coastal saltmarsh vegetation community TEC at these scales and the area of clearing required for the proposed development, the impact of the clearing on this TEC is not considered to be significant. A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020 within the subject site. A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera (Accendo 2020). No Threatened Flora pursuant to the *Biodiversity Conservation Act 2016* (BC Act) nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey (Accendo 2020). A search of the DBCA's Threatened Fauna database was undertaken to establish whether species declared as 'Rare or likely to become extinct' (Schedule 1), 'Birds protected under	

Principle	Assessment	Conclusion
	an international agreement' (Schedule 3) and 'Other specially protected fauna' (Schedule 4) as listed under the *Biodiversity Conservation Act 2016* have been recorded in proximity to the subject site. The NatureMap Report identified four Threatened fauna species, two Priority 4 fauna species, eight fauna species protected under international agreement and one other specially protected fauna species as occurring within 2 km of the subject site. The EPBC Act Protected Matters Search Tool (PMST) also identified several Threatened and Migratory species that could potentially occur within or in proximity to the subject site. This included three species classified as Vulnerable, two Endangered species, one Critically Endangered species and 20 Migratory bird species. The conservation significant fauna species considered likely to occur within the subject site are waders and waterbirds. This is on the basis that fauna habitat within the subject site is exclusively restricted to the coastal saltmarsh vegetation community TEC. It is also noted that the Vasse-Wonnerup wetland provides habitat for more than 30,000 waterbirds, being one of the most significant waterbird habitats in Western Australia. Of the abovementioned species, eight migratory bird species are considered likely to occur within or adjacent (Vasse-Wonnerup wetlands) to the subject site. No threatened fauna species are considered likely to inhabit the subject site. Habitat for migratory bird species within the subject site is restricted to the coastal saltmarsh vegetation community TEC. The pasture which constitutes the majority of the subject site does not provide habitat for wetland fauna. Accordingly, waterbirds within the subject site may only occur as vagrants given the substantial area of coastal vegetation available in proximity to the subject site. While the proposed development will result in the removal of a small area of TEC/PEC, the vegetation association, fauna habitats and landform types present within the application area are well represented in surrounding areas (Accendo 2020; GIS Database). The application area is unlikely to represent an area of higher biodiversity than surrounding areas, in either a local or regional context, particularly in consideration of the historical and current land uses (livestock grazing). This is also represented by the very low onsite	

Principle	Assessment	Conclusion
	species diversity (i.e. only five native species were identified during the flora and vegetation survey).	
b.) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	A search of the DBCA's Threatened Fauna database was undertaken to establish whether species declared as 'Rare or likely to become extinct' (Schedule 1), 'Birds protected under an international agreement' (Schedule 3) and 'Other specially protected fauna' (Schedule 4) as listed under the *Biodiversity Conservation Act 2016* have been recorded in proximity to the subject site. The NatureMap Report identified four Threatened fauna species, two Priority 4 fauna species, eight fauna species protected under international agreement and one other specially protected fauna species as occurring within 2 km of the subject site. The EPBC Act *Protected Matters Search Tool* (PMST) also identified several Threatened and Migratory species that could potentially occur within or in proximity to the subject site. This included three species classified as Vulnerable, two Endangered species, one Critically Endangered species and 20 Migratory bird species. The conservation significant fauna species considered likely to occur within the subject site are waders and waterbirds. This is on the basis that fauna habitat within the subject site is exclusively restricted to the coastal saltmarsh vegetation community TEC. It is also noted that the Vasse-Wonnerup wetland provides habitat for more than 30,000 waterbirds, being one of the most significant waterbird habitats in Western Australia. The likelihood of each of the identified fauna species occurring within the subject site was assessed (refer to Table 3 within **Appendices B, C** and **D**). The Threatened/Migratory marine species were excluded from this assessment as the subject site is not directly connected to the ocean. The assessment determined that the following eight migratory bird species are considered likely to occur within or adjacent (Vasse-Wonnerup wetlands) to the subject site: • *Charadrius ruficapilluss* (Red-capped Plover) • *Falco peregrinus* (Peregrine Falcon) • *Haliaeetus leucogaster* (White-bellied Sea Eagle) • *Merops ornatus* (Rainbow Bee-eater)	The proposed development in itself is very unlikely to contribute significantly to a long-term reduction in the size of the populations of any of waterbird species of conservation significance. Accordingly, of the eight migratory bird species that are considered likely to occur within the application area due to suitable foraging habitat, these species are considered to be infrequent visitors and none would be especially dependent on the application area for nesting or breeding habitat. The proposed clearing is unlikely to provide habitat significant to any of these species as they are all highly mobile and have broad home ranges. The proposed clearing is not likely to be at variance with this Principle.

Principle	Assessment	Conclusion
	• *Oxyura australis* (Blue-billed Duck) • *Thinornis rubricollis* (Hooded Plover) • *Tringa glareola* (Wood Sandpiper) • *Tringa nebularia* (Common Greenshank, greenshank) No threatened species are considered likely to inhabit the subject site. To access the building envelope within Lots 13 and 14, it is necessary for the driveway to traverse a small area of the coastal saltmarsh vegetation community which may provide habitat to waterbirds. The clearing of 500 m^2 of waterbird habitat is not expected to be significant given that 1.05 ha will be retained onsite and the adjoining Vasse-Wonnerup wetland system provides 900 ha of core wetland habitat. Furthermore, to minimise indirect impacts, a 108 m setback from the proposed onsite effluent disposal area to the Ramsar wetland has been provided. An assessment of the potential impacts to fauna of conservation significance is provided within Table 4 of **Appendices B, C** and **D**. Habitat for migratory bird species within the subject site is restricted to the coastal saltmarsh vegetation community TEC. The pasture areas within the subject site do not provide habitat for wetland fauna. Accordingly, waterbirds within the subject site may only occur as vagrants given the substantial area of coastal vegetation available in proximity to the subject site. The Vasse-Wonnerup Ramsar site comprises an area of 1,115 ha of waterbird habitat in secure conservation areas. The effect of the proposed development will be minimal at the broader scale represented by this reserve area. Therefore, the proposed development in itself is very unlikely to contribute significantly to a long-term reduction in the size of the populations of any of waterbird species of conservation significance. Accordingly, of the eight migratory bird species that are considered likely to occur within the application area due to suitable foraging habitat, these species are considered to be infrequent visitors and none would be especially dependent on the application area for nesting or breeding	

Principle	Assessment	Conclusion
	habitat. The proposed clearing is unlikely to provide habitat significant to any of these species as they are all highly mobile and have broad home ranges.	
c.) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020 within the subject site. A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera (Accendo 2020). No Threatened Flora pursuant to the *Biodiversity Conservation Act 2016* (BC Act) nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey (Accendo 2020).	Removal of the vegetation within the subject site is not likely to be at variance to this Principle as no conservation significant flora species were identified within the subject site.
d.) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	Construction of the proposed driveways within Lots 13 and 14 will result in the removal of approximately 500 m^2 of native vegetation. This vegetation is comprised of the coastal saltmarsh vegetation community TEC/PEC. It is noted that the subject site contains a total of 1.55 ha of the coastal saltmarsh vegetation community TEC. The Threatened Species Scientific Committee (TSSC) provides information on the estimated extent of the coastal saltmarsh vegetation community TEC within Western Australia. An assessment of the significance of the proposed clearing of the TEC within local and regional scales was made by comparing the extent within the clearing footprint to that published for the community (TSSC 2013). The total extent of the coastal saltmarsh vegetation community TEC within Western Australia is estimated to be approximately 4,000 ha (TSSC 2013). The Swan Coastal Plain bio-geographic region contains the largest areas of saltmarsh vegetation in Western Australia. On a local scale, the Broadwater and Vasse-Wonnerup wetland system, comprised of 900 ha of core wetlands (excluding floodplains), has been mapped by Tingay and Tingay (1980) as containing saltmarsh vegetation associated with the TEC. Based on the above, the clearing of 500 m^2 of the coastal saltmarsh vegetation community TEC would result in a reduction of up to 0.0012% of the total estimated extent and less	Clearing of the subject site is likely to be at variance to this Principle given that a small area (500 m^2) of a TEC will be directly impacted. In consideration of the extent of the TEC at a local and regional scale and the area of clearing required for the proposed development, the impact of the clearing on this TEC is not considered to be significant.

Principle	Assessment	Conclusion
	than 0.006% at a local scale. Within the subject site, this would equate to the removal of approximately 3% of the total extent of the coastal saltmarsh vegetation community TEC. As previously discussed, the coastal saltmarsh vegetation within western portion of Lot 15 to be cleared was determined to be in a 'Degraded' condition. With over 50% cover of weed species, this vegetation does not comply with the criterion for the coastal saltmarsh vegetation community TEC. In consideration of the extent of the coastal saltmarsh vegetation community TEC at these scales and the area of clearing required for the proposed development, the impact of the clearing on this community is not considered to be significant. To avoid any potential indirect impacts to the TEC such as the increased risk of spread or introduction of weed during clearing, the applicant has committed to the following mitigation measures: • Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable; • Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and • Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands.	
e.) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Mapping of vegetation complexes for the Swan Coastal Plain places the subject site within the Vasse vegetation complex, which is described as a mixture of the closed scrub of *Melaleuca* species, fringing *Eucalyptus rudis* – Melaleuca species woodlands, as well as tuart – jarrah – marri open forests. South of the Capel River, it also includes areas dominated by *Tecticornia* and *Salicornia* species (Webb *et al.* 2016). The *Swan Coastal Plain Vegetation Complex Statistics Report* (Webb *et al.* 2016) states that 4,924 ha of the complex remains, representing over 31% of its original pre-European extent with 13%	Clearing within the subject site is not likely to be at variance to this Principle as the vegetation is not considered significant as a remnant of native vegetation.

Principle	Assessment	Conclusion
	protected in the reserve system. Therefore, the application area does not represent a significant remnant of native vegetation in an area that has been extensively cleared. While the proposed development will result in the removal of a small area of native vegetation, the vegetation association and landform types present within the application area are well represented in surrounding areas (Accendo 2020; GIS Database). The application area is unlikely to represent an area of higher biodiversity than surrounding areas, in either a local or regional context, particularly in consideration of the historical and current land uses (livestock grazing). The Vasse -Wonnerup Ramsar site comprises an area of 1,115 ha of native vegetation in secure conservation areas. The effect of the proposed development will be minimal at the broader scale represented by this reserve area.	
f.) Native vegetation should not be cleared if it is growing in, or in association with an environment associated with a watercourse or wetland.	The coastal saltmarsh vegetation community within the eastern portion of the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh'. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland. The Wonnerup surge barrier, which is located nearby and downstream of the subject site, prevents flooding of low-lying land during winter storms and restricts connection to the ocean during this period. However, fish gates are opened during summer to allow saltwater to enter the estuary to inhibit the formation of algal blooms (DWER 2018). During this period, the saltmarshes within the subject site are subject to some saltwater influences from the ocean. The driveways within Lots 13 and 14 will traverse an area which is subject to seasonal inundation and therefore a box culvert (1,200 mm wide by 450 mm high) will be laid in the lowest lying part of the waterway to minimise the impacts on the natural hydrology of the area. The hydrological regime will be maintained with the construction of culverts that will allow surface water to move across the landscape in patterns equal to current regimes. The design and installation of the culverts will ensure the surface water flows are maintained, including the hydraulic connectivity between areas of wetlands intersected/fragmented by the driveway. The construction of the driveway will result in	Clearing within the subject site is likely to be at variance to this Principle as native vegetation associated with a watercourse will be subject to clearing. The impact of this clearing will be minimised with the implementation of a CEMP.

Principle	Assessment	Conclusion
	the clearing of a 500 m^2 of vegetation growing in association with a waterway. To minimise impacts as far as practicable to the watercourse, a Construction Environmental Management Plan (CEMP) will be implemented which will address clearing requirements, sedimentation and erosion. The Malbup River is located approximately 100 m east of the building envelope for Lot 13. This watercourse is associated with the Vasse-Wonnerup wetlands which is listed as a Wetland of International Importance under the Ramsar *Convention on Wetlands*. The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and is located to the east of the subject site (refer to Figure 2 of **Appendices B, C and D**). In consideration of the conservation significance of the Vasse-Wonnerup wetland and onsite constraints, site specific buffers have been formulated. Accordingly, the proposed effluent disposal area and building envelope for Lot 13 will be setback 62 m from the mapped boundary of the Conservation Category wetland, and 100 m from the mapped Ramsar wetland. The proposed effluent disposal area and building envelope for Lot 14 will be setback 80 m from the mapped boundary of the Conservation Category wetland, and 108 m from the mapped Ramsar wetland. The proposed building envelope and effluent disposal area for Lot 15 will be setback approximately 300 m from the mapped boundary of the Conservation Category wetland.	
g.) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The sandy soils present within the subject site can be prone to wind and water erosion. Mapping on the DPIRD's NRInfo database shows that soils of the Vasse Wonnerup wet saline flats Phase, present in areas where the coastal saltmash vegetation has been identified, are likely (71% of map unit) to have a 'very high to extreme' hazard for water erosion. Areas mapped as consisting of the Vasse Wonnerup wet flats phase are less likely, mapped as 10% of the map unit likely to have a 'very high to extreme' water erosion hazard. Both Phases are less likely to be susceptible to wind erosion with a 4% and 15% of the map unit for the wet saline flats and wet flats Phases, respectively.	Clearing within the subject site is not considered to be at variance to this Principle given the nature of the site and the proposed works.

Principle	Assessment	Conclusion
	Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling. The sand pad will be constructed to a height of 3.0 m Australian Height Datum (AHD), with this area comprising 1,000 m^2 (25 m x 40 m). With the addition of batters, the total footprint of the sand pad will be 2,000 m^2 (40 m x 50 m). The raised sand pads are not likely to result in any impacts to the existing landform given that there will be no excavations. The construction of the driveway will involve works including the clearing of native vegetation and drainage construction. These works have the potential to result in land degradation if suitable management measures are not appropriately implemented. To effectively manage land degradation impacts, construction works associated with the driveway will be undertaken in accordance with standard operational control which will be documented within a CEMP. The implementation of standard operational controls can be expected to appropriately control the risk of land degradation and as a minimum will include the following management measures: • Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable; • Construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May); • Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and • Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands. Given the small-scale nature of the construction works and the proposed management measures, the proposed clearing is not likely to cause appreciable land degradation in the form of wind or water erosion.	

Principle	Assessment	Conclusion
h.) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The subject site is bounded to the north and south by Conservation zoned lots, Forrest Beach Road to the west and Rural land to east. Crown reserves associated with the Ramsar listed wetlands are located beyond the neighbouring properties to the north, east and south of the adjoining properties. In consideration of the conservation significance of the Vasse-Wonnerup wetland and onsite constraints, site specific buffers have been formulated. Accordingly, the proposed effluent disposal area and building envelope for Lot 13 will be setback 62 m from the mapped boundary of the Conservation Category wetland, and 100 m from the mapped Ramsar wetland. The proposed effluent disposal area and building envelope for Lot 14 will be setback 80 m from the mapped boundary of the Conservation Category wetland, and 108 m from the mapped Ramsar wetland. The proposed building envelope and effluent disposal area for Lot 15 will be setback approximately 300 m from the mapped boundary of the Conservation Category wetland. Altering existing flow paths has the potential to negatively impact the hydrological regime of the nearby conservation area. As discussed, the hydrological regime will be maintained with the construction of culverts that will allow surface water to move across the landscape in patterns equal to current regimes. The design and installation of the culverts will ensure the surface water flows are maintained, including the hydraulic connectivity between areas of wetlands intersected/fragmented by the driveway. Therefore, changes in hydrology are not expected to impact the nearby conservation area. To avoid any potential indirect impacts to the adjoining systems such as the increased risk of spread or introduction of weeds during clearing, the applicant has committed to the following mitigation measures: • Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;	The proposed clearing is not likely to be at variance to this Principle as there will be no direct or indirect impacts to conservation areas in proximity to the subject site.

Principle	Assessment	Conclusion
	• Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and • Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands.	
i.) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The proposed building envelope and driveways have been strategically located and designed to maintain existing hydrological functions. The current water cycle on the subject site consists of inputs from rainwater being infiltrated on site. The development is not proposing to significantly alter this process, except for the importation of potable water to top up rainwater tanks, as required. The proposed development consists of a closed cycle, with rainwater water being captured on site and reinfiltrated via the proposed effluent disposal site. A *Site and Soil Evaluation* (WML 2020) was undertaken for the subject site to determine the capacity of the site for onsite effluent disposal in consideration of the *Government Sewerage Policy* (DPLH 2019). Several options were considered for both the treatment system and land application area (LAA). Based on a site-specific investigation, it was recommended to treat the sewage wastewater to a secondary level using an Aerobic Treatment Unit (ATU) with nutrient removal by a suitable Department of Health (DOH)-approved treatment system. The treated wastewater shall then be applied to an elevated LAA via sub-surface drip irrigation (WML 2020). Design specifications of the proposed secondary treatment system, including the location and discharge mechanisms (i.e. land application areas or discharge outlets) have been recommended to minimise the likelihood of causing deterioration in the quality of surface or groundwater (WML 2020). The construction of the driveway will involve works including the clearing of native vegetation, construction earthworks and drainage construction. Each of these may have	The clearing is not considered to be at variance to this Principle as proposed management measures will ensure that that the clearing will not alter natural surface or groundwater interactions within the subject site.

Principle	Assessment	Conclusion
	the potential to result in an increase in water turbidity (suspended sediments) and / or sedimentation within the watercourse located in the subject site. To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May) and all works will be undertaken in accordance with a CEMP.	
j.) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Flood mapping prepared by the DWER demonstrates that the subject site is located within the flood fringe (DWER 2015). Clearing of the driveways and the construction of the culvert is unlikely to increase run off and therefore intensity or incidence of flooding. The construction of the sand pad for the proposed dwelling will be constructed to a height of 3.0 m AHD. The current water cycle on the subject site consists of inputs from rainwater being infiltrated on site. The clearing is unlikely to significantly alter this process and is unlikely to increase run off and therefore intensity or incidence of flooding.	Clearing within the subject site is not likely to be at variance to this Principle as it is unlikely to increase run off and therefore the intensity or incidence of flooding.

Summary

The above assessment of the proposed clearing against the Ten Clearing Principles demonstrates that the clearing is not at variance to eight of the ten Principles. It was determined that clearing is likely to be at variance to the following Principles:

d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community; and

f) Native vegetation should not be cleared if it is growing in, or in association with an environment associated with a watercourse or wetland.

The proposed clearing is likely to be at variance to Principle d.) given that a small area (500 m^2) of a TEC will be directly impacted. In consideration of the extent of the TEC at a local and regional scale and the area of clearing required for the proposed development, the impact of the clearing on this TEC is not considered to be significant.

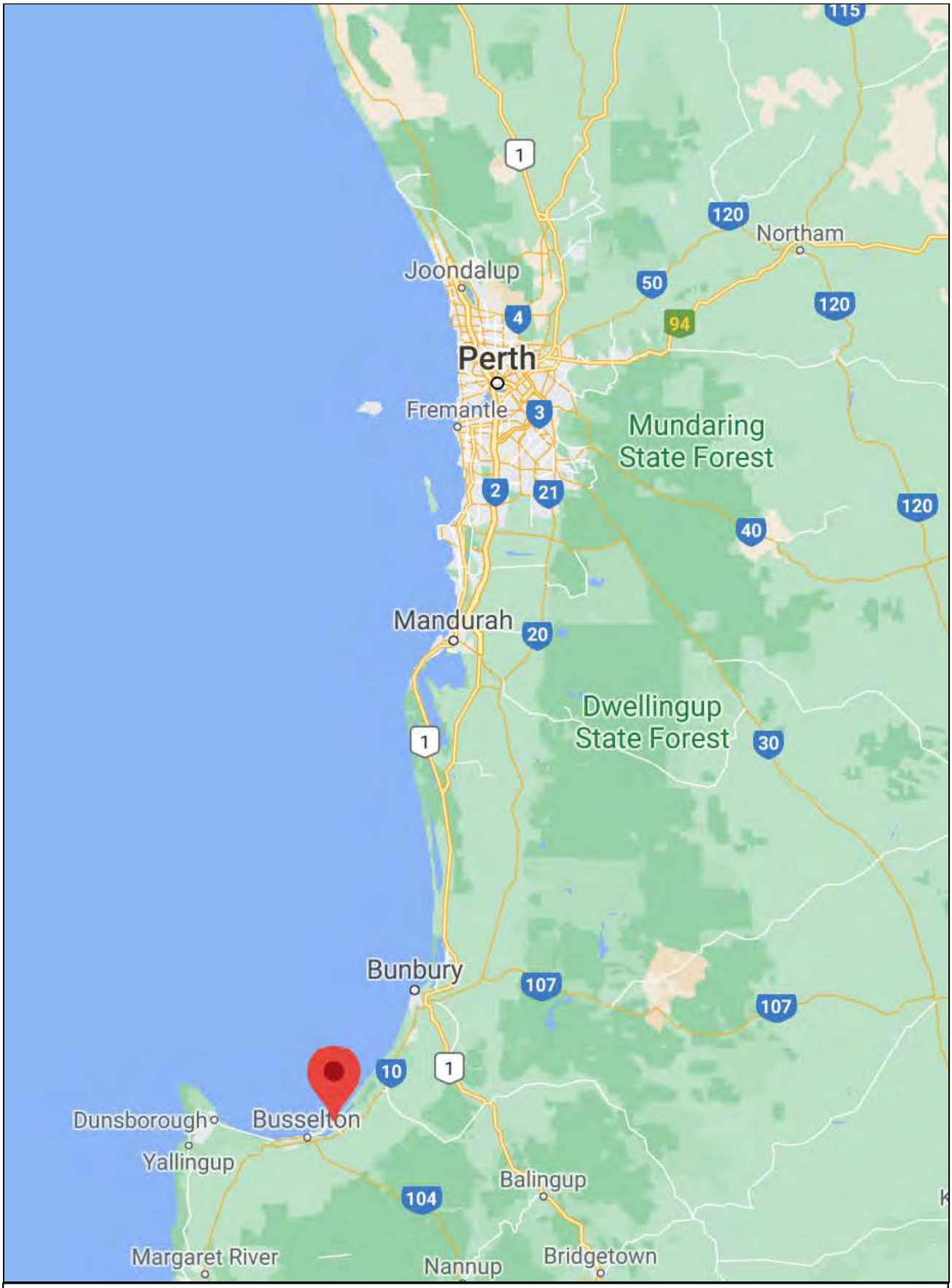
Furthermore, the proposed clearing is likely to be at variance to Principle f.) as native vegetation associated with a watercourse will be subject to clearing. The impact of this clearing will be minimised with the implementation of a CEMP during construction works.

In consideration of the small scale nature of the proposed works and the proposed mitigation and management measures, it is considered that the potential impacts can be suitably managed.

Yours sincerely,

Principal Consultant

FIGURES



PROJECT	Lot 13, 14 & 15 Forrest Beach Road, Wonnerup	Project Number	Drawing Number	Revision
		2102	Figure 1	A
DRAWING TITLE	Figure 1 – Site Locality	Designed PN	Checked	
		Drawn PN	Approved	
CLIENT	Wonnerup Group Pty Ltd	Date	16/02/2021	
		Local Authority	City of Busselton	
		Sheet 1 of 1		

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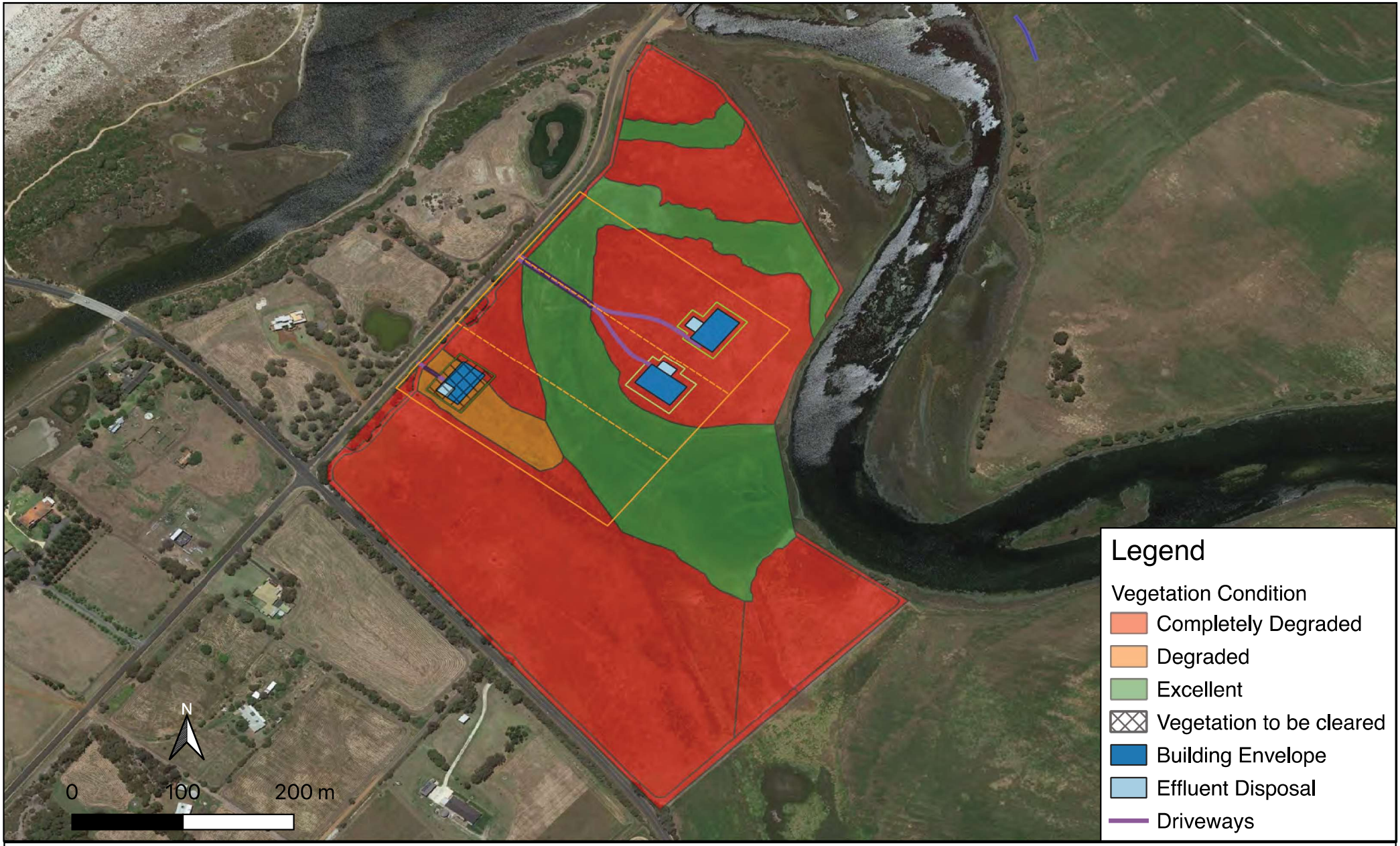

PROJECT	Lots 13, 14 & 15 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 2 Vegetation Condition
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2102	Designed	PN
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	16/02/2021	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

APPENDIX A – FLORA AND VEGETATION SURVEY

accendo AUSTRALIA

FLORA AND VEGETATION SURVEY

Lots 12 - 17 Forrest Beach Road, Forrest Beach

SEPTEMBER 2020

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Appendix C – Plot Data

1. INTRODUCTION

1.1. Background

Wonnerup Group Pty Ltd (the proponent) are proposing to construct driveway access and building foundations for Lots 12 – 17 Forrest Beach Road, Forrest Beach (herein referred to as the site). This will require driveway access from Layman and Forrest Beach Roads, including traversing areas of a potential Threatened Ecological Community (TEC). The site is located on the Swan Coastal Plain approximately 9 km north northeast of the Busselton city centre (refer to **Figure 1**).

1.2. Purpose

A detailed flora and vegetation survey was required to provide an assessment of the botanical values within the site which could then inform the development process.

The objectives of the survey were to:

- Undertake a detailed spring flora and vegetation survey in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance: Flora and Vegetation Survey for Environmental Impact Assessment* (2016);
- Undertake a systematic search for all vascular plant taxa present;
- Identify the presence of any TECs and Priority Ecological Communities (PECs); and
- Record the locations and numbers present of any Threatened and Priority Flora.

2. EXISTING ENVIRONMENT

2.1. Climate

The Forrest Beach area experiences a dry Mediterranean climate of hot dry summers and cool wet winters. Long-term climatic averages indicate the site is located in an area of moderate to high rainfall, receiving 677.6 mm on average annually (data for Busselton Aero, the nearest currently reporting station) (Bureau of Meteorology 2020), with the majority of rainfall received between May and August. The area experiences rainfall on an average of 84 days per year. Mean maximum temperatures range from 16.8°C in July to 30.1°C in February. Mean minimum temperatures range from 6.9°C in July to 14.7°C in February.

2.2. Soils

The Atlas of Australian Soils maps the soils for the site as being part of Map Unit A13, which is described as a coastal dune formation backed by low-lying deposits of inlets and estuaries with the chief soils being calcareous sands (Natural Resource Information Centre 1991).

2.3. Conservation Significant Flora

Pursuant to the *Biodiversity Conservation Act 2016* ('BC Act'), the Minister for the Environment produces a gazetted 'Wildlife Conservation (Rare Flora) Notice' that lists Threatened (or Declared Rare) Flora under two Schedules; extant and presumed extinct. The Department of Biodiversity, Conservation and Attractions (DBCA) also produces a list of Priority Flora that have not been assigned statutory protection under the BC Act but may be under some degree of threat. The DBCA recognises five Priority Flora levels. The definitions for each category of Threatened and Priority Flora are shown in **Appendix A** (PWS 2013).

In addition to protection under State legislation, selected species of flora are also afforded statutory protection at a Federal level pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act provides for the protection of Threatened species, pursuant to Schedule 1 of the Act, and are defined as "Critically Endangered", "Endangered", "Vulnerable" or "Conservation Dependent" under Section 179. Definitions of these categories are provided in **Appendix A**. Any action likely to have a significant impact on a species listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment.

Searches of both the State and Commonwealth databases identified 71 taxa of conservation concern with the potential to occur within the site (refer to **Table 1**). Of these taxa, 17 are listed as Threatened under the BC Act, of which four are orchids. The remainder are perennial herbs or grasses, shrubs or trees and would be observable at all times of the year. Orchid species are perennial geophytes and usually only identifiable when flowering. *Caladenia busselliana, Caladenia huegelii,* and *Caladenia procera* flower from September to October and *Drakaea elastica* flowers from October to November.

Table 1: Threatened and Priority Flora potentially occurring within the survey area based on database searches (VU = Vulnerable; EN = Endangered; CR = Critically Endangered; T = Threatened; 1 – 4 = Priority Flora Category).

Taxon Name	PWS Ranking	EPBC Act Category	Flowering Period
Acacia benthamii	2		
Acacia flagelliformis	4		Jul-Sep
Acacia semitrullata	4		Jun-Aug

Taxon Name	PWS Ranking	EPBC Act Category	Flowering Period
Acacia sp. Binningup (G. Cockerton et al. WB 37784)	1		Aug
Amperea micrantha	2		Sep-Oct
Andersonia ferricola	1		
Angianthus drummondii	3		Oct, Nov
Aponogeton hexatepalus	4		Aug-Sep
Austrostipa bronwenae	T	EN	Oct-Nov
Banksia meisneri subsp. *ascendens*	4		Apr-Aug
Banksia nivea subsp. *uliginosa*	T	EN	Aug-Sep
Banksia squarrosa subsp. *argillacea*	T	VU	Jul-Aug
Blennospora doliiformis	3		
Boronia anceps	3		Sep-Jan
Caladenia busselliana	T	EN	Sep-Oct
Caladenia huegelii	T	EN	Aug-Oct
Caladenia procera	T	CR	Sep-Oct
Caladenia speciosa	4		Sep-Oct
Calothamnus quadrifidus subsp. *teretifolius*	4		
Cardamine paucijuga	2		Aug-Nov
Chamaescilla gibsonii	3		
Chamelaucium erythrochlorum	4		Nov - Feb
Chamelaucium roycei	T		Aug - Nov
Chamelaucium sp. S coastal plain (R.D.Royce 4872)	T	VU	Oct-Dec
Chorizema carinatum	3		Oct-Nov
Dillwynia sp. Capel (P.A. Jurjevich 1771)	1		Sept-Oct
Drakaea elastica	T	EN	Oct-Nov
Eryngium sp. ferox (G.J. Keighery 16034)	3		Oct-Nov
Eryngium sp. *subdecumbens* (G.J. Keighery 5390)	3		
Eucalyptus rudis subsp. *cratyantha*	4		-
Franklandia triaristata	4		Aug-Oct
Gastrolobium sp. Yoongarillup (S.Dilkes s.n. 1/9/1969)	1		Oct
Grevillea brachystylis subsp. *brachystylis*	3		Aug-Nov
Grevillea bronwenae	3		June-Nov
Grevillea elongata	T	VU	Oct
Hakea oldfieldii	3		Sep
Isopogon formosus subsp. *dasylepis*	3		Jun, Sep-Dec
Jacksonia gracillima	3		Oct-Nov
Johnsonia inconspicua	3		Nov
Lambertia echinata subsp. *occidentalis*	T	EN	Oct-Dec

Taxon Name	PWS Ranking	EPBC Act Category	Flowering Period
Lambertia orbifolia subsp. *Scott River Plains (L.W. Sage 684)*	T	EN	Jan-Jul
Lasiopetalum laxiflorum	3		Oct, Nov
Lasiopetalum membranaceum	3		Oct-Nov
Leucopogon sp. Busselton (D. Cooper 243)	2		Aug-Sep
Loxocarya magna	3		-
Meionectes tenuifolia	3		Nov-Dec
Microtis quadrata	4		Dec-Jan
Montia australasica	2		Oct-Nov
Myriophyllum echinatum	3		Oct-Nov
Olearia strigosa	3		
Ornduffia submersa	4		Sep-Oct
Petrophile latericola	T	EN	Oct, Nov
Puccinellia vassica	1		Nov
Pultenaea pinifolia	3		Oct
Schoenus benthamii	3		
Schoenus loliaceus	2		Oct-Nov
Schoenus natans	4		Aug-Nov
Schoenus pennisetis	3		Aug-Dec
Stachystemon exilis	1		
Stylidium longitubum	4		Nov
Stylidium paludicola	3		
Synaphea hians	3		Sep-Oct
Synaphea petiolaris subsp. *simplex*	3		Sep-Oct
Tetraria australiensis	T	VU	Dec
Thysanotus glaucus	4		Nov-Feb
Tripterococcus sp. brachylobus (A.S. George 14234)	4		Feb
Verticordia attenuata	3		Jan
Verticordia densiflora var. *pedunculata*	T	EN	Dec
Verticordia lindleyi subsp. *lindleyi*	4		Nov-Jan
Verticordia plumosa var. *ananeotes*	T	EN	Dec
Verticordia plumosa var. *vassensis*	T	EN	Oct

2.4. Conservation Significant Communities

The DBCA defines an ecological community as "*a naturally occurring assemblage that occurs in a particular type of habitat*" (PWS 2015). A TEC is one that has declined in area or was originally limited in distribution. Uncommon ecological communities that do not strictly meet TEC defined criteria, or are inadequately defined, are listed by the DBCA as a Priority Ecological Community (PEC). Definitions of the categories of Threatened and Priority Ecological Communities are provided in **Appendix A** (PWS 2019).

In addition to protection under State legislation, selected ecological communities are also afforded statutory protection at a Federal level pursuant to the EPBC Act. The EPBC Act provides for the protection of TECs, which are listed under section 181 of the Act, and are defined as "Critically Endangered", "Endangered" or "Vulnerable" under Section 182. Similar to flora species listed under the EPBC Act, any action likely to have a significant impact on a TEC listed under the EPBC Act requires Commonwealth approval.

A search of the DBCA's databases found five TECs and seven PECs endorsed under State legislation and policy recorded within 10 km of the site. This included the following:

- SCP 07 'Herb rich saline shrublands in clay pans' (VU);
- SCP 08 'Herb rich shrublands in clay pans' (VU);
- SCP 10a 'Shrublands on dry clay flats' (EN);
- SCP 1b 'Southern *Corymbia calophylla* woodlands on heavy soils' (VU);
- SCP 10b 'Shrublands on southern Swan Coastal Plain ironstones (Busselton area) (CR);
- *Eucalyptus cornuta*, *Agonis flexuosa* and *Eucalyptus decipiens* forest on deep yellow-brown siliceous sands over limestone (Priority 1);
- *Eucalyptus rudis, Corymbia calophylla, Agonis flexuosa* closed low forest (near Busselton) (Priority 1);
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (Priority 3);
- Wooded wetlands which support colonial waterbird nesting areas (Priority 2);
- SCP 21b 'Southern *Banksia attenuata* woodlands' (Priority 3);
- 'Subtropical and Temperate Coastal Saltmarsh' (Priority 3); and
- 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' (Priority 3).

The 'Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region' is also listed as an 'Endangered' TEC by the Commonwealth Department of Agriculture, Water and the Environment (DAWE). Under the EPBC Act, the Subtropical and Temperate Coastal Saltmarsh is listed as 'Vulnerable', and the Tuart woodlands, SCP 1b, SCP 10b, SCP 07 and SCP 08 are listed as 'Critically Endangered'.

The mapped extent and/or buffer zones of one community of conservation concern intersects the site, namely the 'Subtropical and Temperate Coastal Saltmarsh' (Priority 3 under state legislation and 'Vulnerable' under the EPBC Act).

The Subtropical and Temperate Coastal Saltmarsh' (Coastal Saltmarsh) is listed under the EPBC Act as a TEC in the 'Vulnerable' category and as a Priority 3 community by the DBCA. It occurs on the coastline south of the South-east Queensland IBRA on the east coast of Australia and south of Shark Bay in Western Australia (Department of Agriculture, Water and the Environment 2013). The habitat for this community is mainly coastal areas under regular or intermittent tidal influence, especially around estuaries. It can also occur where groundwater is connected to tidal water bodies. In Western Australia, saline coastal wetlands that abut coastal saltmarshes and are connected to the sea in some way are also part of the Coastal Saltmarsh community.

Diagnostic characters for the Coastal Saltmarsh community include:

- Occurs south of 23° 37' S latitude - from the central Mackay coast on the east coast of Australia, southerly around to Shark Bay on the west coast of Australia (26° latitude), and including the Tasmanian coast and islands within the above range;
- Occurs on the coastal margin, along estuaries and coastal embankments and on low wave energy coasts;

- Occurs on places with at least some tidal connection, including rarely-inundated supratidal areas, intermittently opened or closed lagoons, and groundwater tidal influences, but not areas receiving only aerosol spray;
- Occurs on sandy or muddy substrate and may include coastal clay pans (and the like);
- Consists of dense to patchy areas of characteristic coastal saltmarsh plant species (i.e. salt- tolerant herbs, succulent shrubs or grasses, that may also include bare sediment as part of the mosaic);
- Proportional cover by tree canopy such as mangroves, *Melaleucas* or *Casuarinas* is not greater than 50%, nor is proportional ground cover by seagrass greater than 50%;
- In ecotones, patches with >50% Coastal Saltmarsh vegetation is considered part of the community;
- Patches <0.1 ha and occur in isolation are excluded from the community;
- The community requires some form of on-going connection to the tidal regime; and
- Patches or areas of saltmarsh containing >50% weeds are excluded from the community.

2.5. Vegetation Complexes

Mapping of vegetation complexes for the Swan Coastal Plain places the site within the Vasse vegetation complex, which is described as a mixture of the closed scrub of *Melaleuca* species, fringing *Eucalyptus rudis* – Melaleuca species woodlands, as well as tuart – jarrah – marri open forests. South of the Capel River, it also includes areas dominated by *Tecticornia* and *Salicornia* species (Webb *et al.* 2016). The *Swan Coastal Plain Vegetation Complex Statistics Report* (Webb *et al.* 2016) states that 4,924 ha of the complex remains, representing over 31% of its original pre-European extent with 13% protected in the reserve system.

3. METHODOLOGY

3.1. Field Survey

A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020. A detailed survey was undertaken in the stands of native vegetation, comprising five 100 m^2 sampling plots (10m x 10m quadrats) (refer to **Figure 2**), which were selected to adequately sample the flora within a stand. Plots were positioned to sample a representative and homogeneous (i.e. not located in transitional areas between communities) area of each stand. In addition, opportunistic plant taxa that were observed, but not located at a particular survey point, were also recorded throughout the course of the survey. In areas of degraded vegetation (i.e. not considered as native vegetation), another nine recce (or 'relevé') points were used to sample the vegetation.

Environmental data recorded included topographic position, aspect, slope, soil colour and texture class, rock outcropping, litter cover as well as the degree of disturbance and an estimate of the time since the last fire event. The condition of the vegetation of the site was assessed to assist in determining the conservation values of the site. The vegetation condition was rated according to Keighery (1994), a vegetation condition scale commonly used in the Metropolitan Region and southwest. The categories are listed and defined in **Table 2**. Data on the vegetation structure was also recorded and included the height of the three main strata and the dominant species within each stratum. The vegetation structural description follows that of the National Vegetation Information System (Thackway *et al*. 2006).

Table 2. Vegetation condition scale (Keighery 1994).

Vegetation Condition	Definition
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

All plant specimens collected during the field survey were dried, pressed and then sorted in accordance with the requirements of the Western Australian Herbarium. Identification of specimens occurred through comparison with named material and through the use of taxonomic keys. Taxonomic determinations were made using reference material at the Western Australian State Herbarium. Taxa names utilise the current terminologies from FloraBase (2020). Family names utilise the revised phylogeny of the Angiosperm Phylogeny Group - APGIII (FloraBase 2020).

3.2. Study Limitation and Survey Effort

Various factors can limit the effectiveness of a vegetation survey. Pursuant to *Technical Guidance: Flora and Vegetation Survey for Environmental Impact Assessment* (2016), these factors have been identified and their potential impact on the effectiveness of the survey has been assessed (refer to **Table 3**).

Table 3. Potential limitations affecting the vegetation survey.

Potential limitations	Constraint	Comment
Competency and experience of the botanists undertaking the survey	No	The survey was undertaken by a botanist with a comprehensive knowledge of southwest vegetation, with at least 15 years' experience in vegetation surveys in Western Australia.
Seasonality	Minor	The rainfall in the three months prior to the survey was below average for the area. Maximum and minimum temperatures were up to 1°C higher than the mean. The survey timing was very early in spring, denoting that not all taxa could be identified to at least species rank.
Adequate ground coverage and intensity of survey effort	No	The survey area was traversed on foot. It is considered the survey mapping points provided adequate coverage of the site.
Proportion of Flora identified	No	The openness of the vegetation allowed most species to be observable at the time pf the survey.
Burn Cycle and Disturbance	Minor	The majority of the site has been cleared with a resultant loss of structure and likely impact on the native species richness.
Resources	No	Adequate resources were available to conduct the survey.
Access restrictions	No	All parts of the site were accessible.

4. RESULTS

4.1. Flora

4.1.1.1. Floristic Summary

A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera. For a complete species list refer to **Appendix B**.

4.1.1.2. Threatened and Priority Flora

No Threatened Flora pursuant to the BC Act nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey.

4.2. Vegetation

4.2.1.1. Plant Communities

The vegetation within the site is mostly cultivated pasture intersected by areas of samphire shrubland. The pasture grasses include **Lolium rigidum, *Avena barbata* and *Bromus diandrus.* Other exotic taxa in the pastured areas include *Solanum linnaeanum, *Ornithopus compressus, *Lotus subbiflorus* and *Romulea rosea* var. *australis.* The fringe of the samphire shrublands were also dominated by **Carex divisa* (divided sedge) and *Juncus kraussii* was present in some parts. There were also remnant trees of *Agonis flexuosa* along the boundary adjacent to Forrest Beach Road, in addition to planted individuals of *Eucalyptus camaldulensis* and **Olea europaea.*

The samphire shrubland within the site is dominated by *Salicornia quinqueflora.* At the time of the survey, only vegetative plants were observed and so a definitive identification to species level is not possible, although based on distribution, it is the mostly likely species to occur within the site. Associated species include *Senecio condylus, *Lolium rigidum,* a Chenopodiaceae species and another unidentifiable monocot species.

4.2.1.2. Vegetation Condition

The majority of the site is in a 'Completely Degraded' condition as it has lost much of its original natural botanical value from its conversion to agricultural pasture (refer to **Figure 3**). The samphire shrubland is in 'Excellent' condition, with only a minor presence of weeds. A patch of vegetation in 'Degraded' condition occurs in the northern part of the site where the samphire shrubland on higher ground has been invaded by non-native grasses and **Carex divisa* (see plate for Plot Q05).

4.2.1.3. Conservation Significance

The site lies adjacent to the Wonnerup Estuary, which contains samphire shrublands considered to be part of the Subtropical and Temperate Coastal Marsh TEC (DBCA 2019). The conservation advice for this TEC lists criteria to assess whether stands of vegetation form part of this TEC. An assessment of the samphire shrublands within the site against these criteria is provided below:

Inclusive factors

1. Occurs south of 23° 37' S latitude - from the central Mackay coast on the east coast of Australia, southerly around to Shark Bay on the west coast of Australia (26° latitude), and including the Tasmanian coast and islands within the above range.

   Consistent - The site is located approximately 33° S on the Western Australian coast.

2. Occurs on the coastal margin, along estuaries and coastal embankments and on low wave energy coasts.
   Consistent - The vegetation occurs adjacent to the Wonnerup Estuary.
3. Occurs on places with at least some tidal connection, including rarely-inundated supratidal areas, intermittently opened or closed lagoons, and groundwater tidal influences, but not areas receiving only aerosol spray
   Consistent - The presence of the Wonnerup surge barrier prevents seawater connection for part of the year (particularly winter storm periods). The barrier is regularly opened in summer months and fish gates have been installed to allow some movement of water into the estuary, indicating that the area is connected to the ocean (DWER 2018). On this basis, the samphire shrublands within the site meet the criterion of intermittent opened lagoon or rarely-inundated supratidal areas.
4. Occurs on sandy or muddy substrate and may include coastal clay pans (and the like).
   Consistent - The substrate is saturated clays.
5. Consists of dense to patchy areas of characteristic coastal saltmarsh plant species (i.e. salt- tolerant herbs, succulent shrubs or grasses, that may also include bare sediment as part of the mosaic).
   Consistent - The samphire shrublands is dominated by a *Salicornia* species, characteristic of coastal saltmarshes in WA.
6. Proportional cover by tree canopy such as mangroves, *Melaleucas* or *Casuarinas* is not greater than 50%, nor is proportional ground cover by seagrass greater than 50%.
   Consistent - There is no tree cover in the samphire shrubland.

Excluding factors

1. Saltmarsh occurring in seepage zones on sea cliffs and elevated rock platforms above the tidal limit and on elevated headlands subject only to aerosolic salt.
   Inconsistent - Habitat does not occur within the site.
2. Saltmarsh occurring on inland saline soils with no tidal connection.
   Inconsistent - Saltmarsh is coastal and connected to tidal influence for part of the year.
3. Patches <0.1 ha and occur in isolation are excluded from the community.
   Inconsistent - Saltmarsh within the site exceeds 0.1 ha.
4. Patches or areas of saltmarsh containing > 50% weeds are excluded from the community.
   Inconsistent - Stands of saltmarsh within the site are in 'Excellent' condition and contain less than 50% weed cover.
5. Patches of saltmarsh (possibly senescent) within the coastal margin that are disconnected (either naturally or artificially) from a tidal regime but were once connected.
   Inconsistent - The saltmarsh within the site is connected to a tidal regime when the surge barriers are open.

4.3. Weeds

Most of the taxa recorded during the survey are weeds or exotic species as the land has been used for stock pasture. **Solanum linnaeanum* (Apple of Sodom) is a Declared Pest pursuant to the *Biosecurity and Agriculture Management Act 2007*. One large individual of**Solanum linnaeanum* was recorded in the pasture in the northern part of the site.

5 DISCUSSION

No Threatened or Priority Flora were observed during the survey. The survey was conducted in early spring and possibly before the usual flowering period of some conservation-coded taxa that occur in the local region. As the property has been developed for pasture and stock grazing, it is highly unlikely that any of the potential conservation-coded flora would occur within the site.

The samphire shrubland within the site forms part of the 'Subtropical and Temperate Coastal Saltmarsh', which is listed as a TEC under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Wonnerup Estuary, which is considered part of the same TEC (DBCA 2019). A key criterion to be considered part of the TEC is a continuous or intermittent saltwater influence. The Wonnerup surge barrier, which is located nearby and downstream of the site, prevents flooding of low-lying land during winter storms and restricts connection to the ocean during this period. However, fish gates are opened during summer to allow saltwater to enter the estuary to inhibit the formation of algal blooms (DWER 2018). During this period, the saltmarshes within the site are subject to some saltwater influences from the ocean.

The proposed driveways to Lots 13 and 14 will traverse the samphire shrubland TEC to enable connection to the proposed building envelopes. Construction of the driveways will require special consideration to maintain the functionality of the samphire shrublands. The building envelope for Lot 15 is proposed for an area of samphire shrubland, but this area is in a 'Degraded' condition with over 50% cover of weed species and does not form part of the TEC.

6 SUMMARY

The samphire shrublands within the site retains significant botanical values as it is part of the 'Sub-tropical and Temperate Coastal Saltmarsh' TEC and is contiguous with saltmarshes in the Wonnerup Estuary. Construction of the driveways will require special consideration to maintain the functionality of the samphire shrublands.

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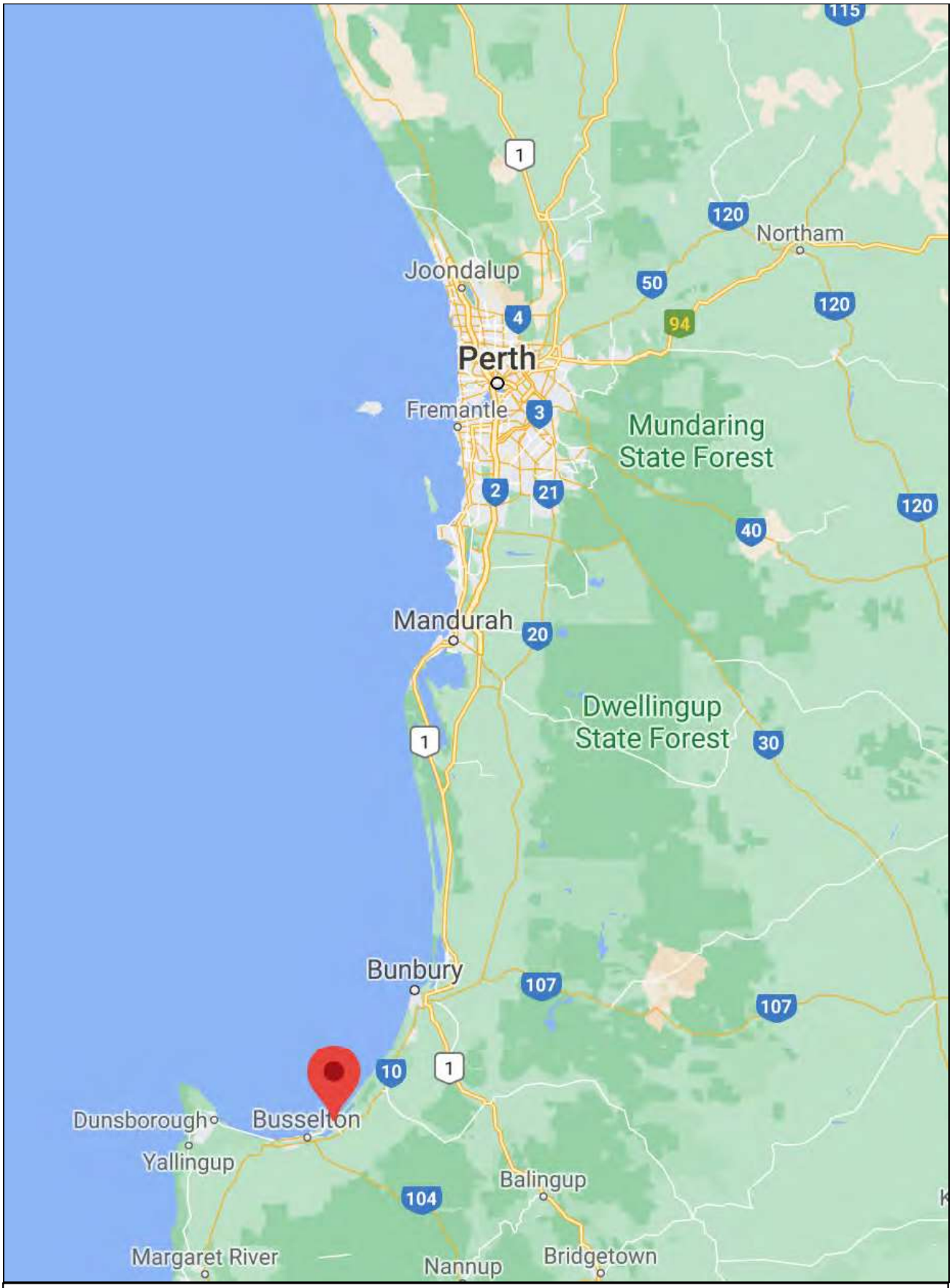
FIGURES



PROJECT	Lot 12 – 17 Forrest Beach Road, Wonnerup	Project Number	Drawing Number	Revision
		2041	Figure 1	A
DRAWING TITLE	Figure 1 – Site Locality	Designed PN	Checked	
		Drawn PN	Approved	
CLIENT	Wonnerup Group Pty Ltd	Date	16/09/2020	
		Local Authority	City of Busselton	
		Sheet 1 of 1		

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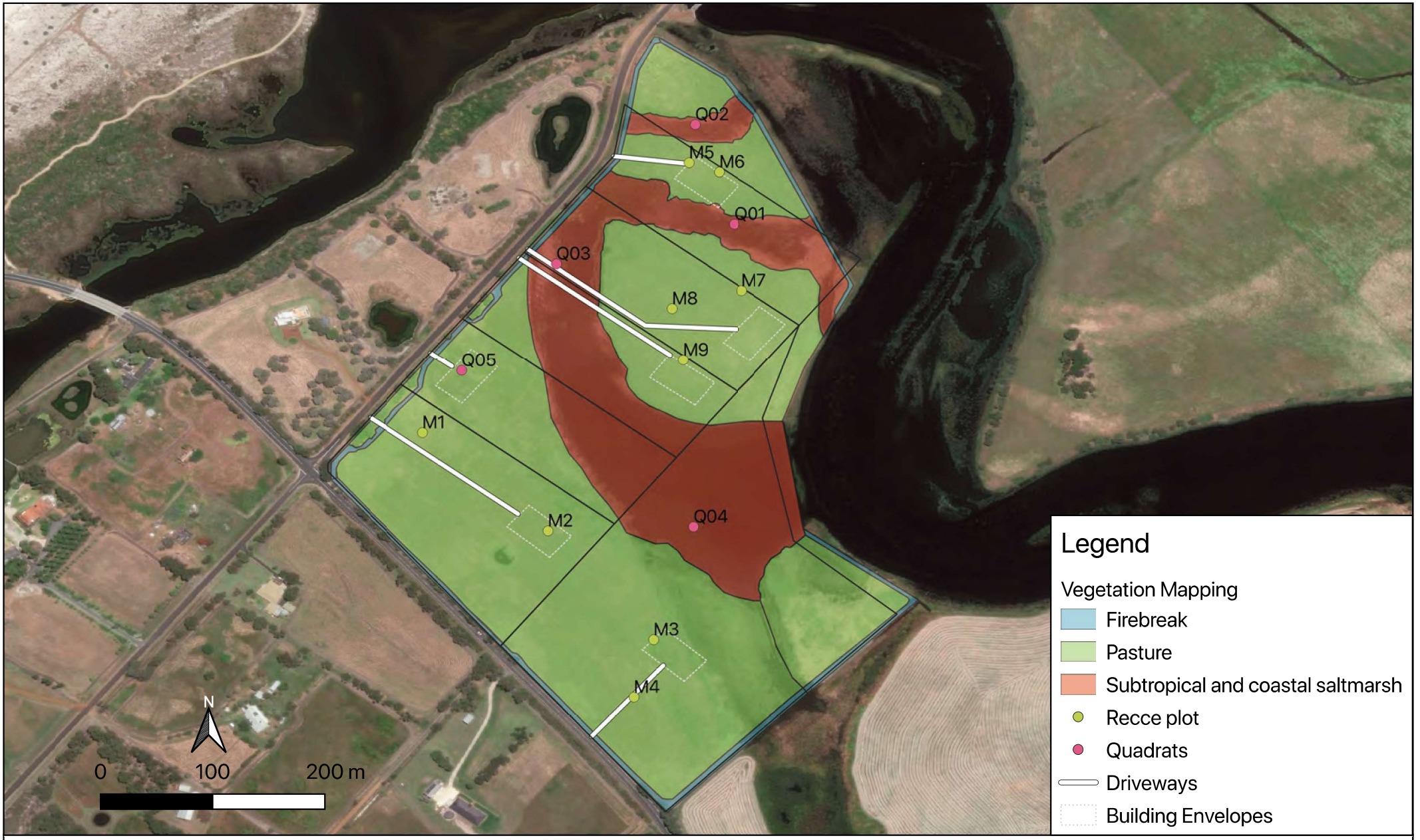

PROJECT Lots 12 to 17 Forrest Beach Road, Wonnerup

DRAWING TITLE Figure 2 Vegetation Mapping

CLIENT Wonnerup Group Pty Ltd

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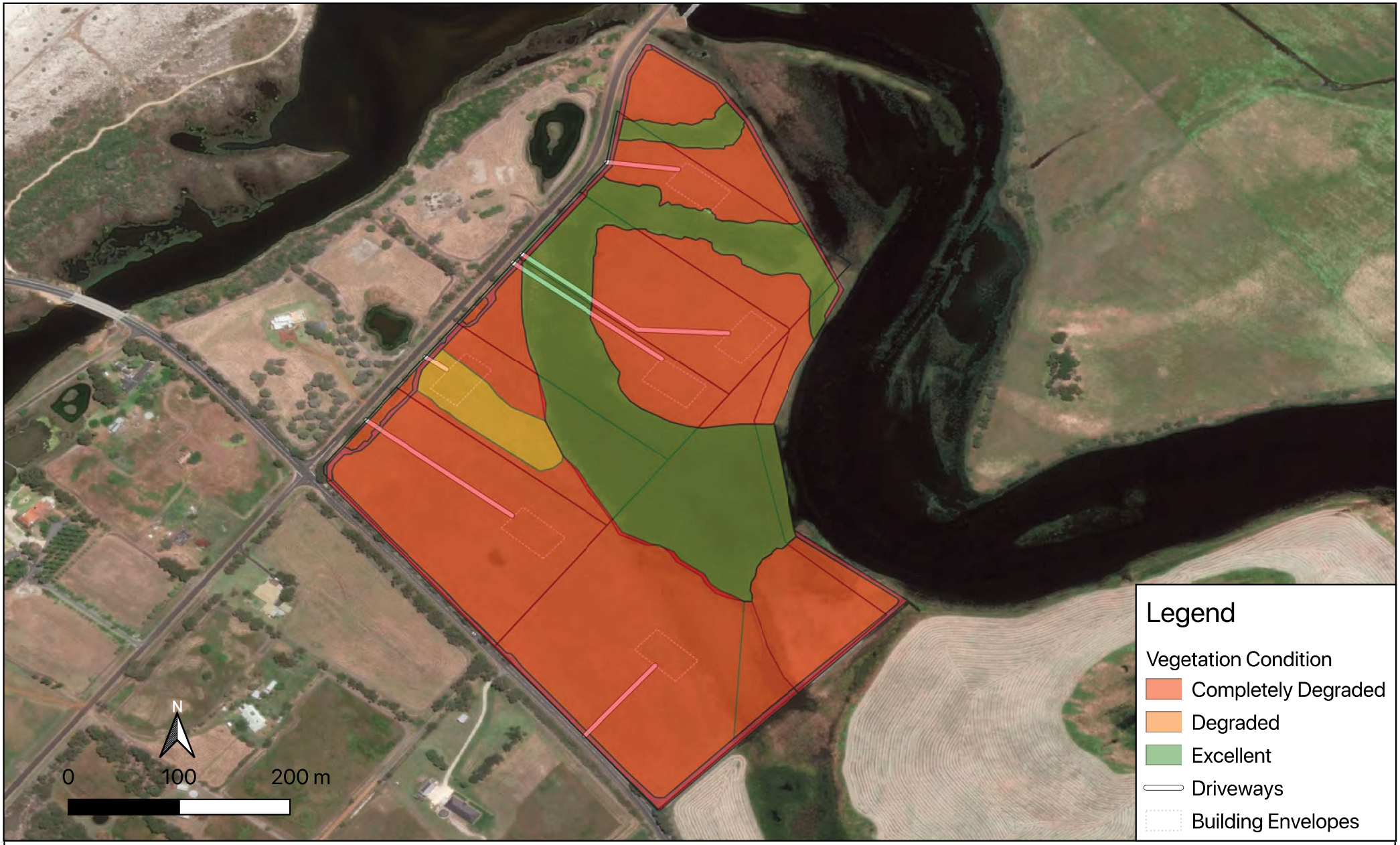
Project Number	2041	Designed	PN
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	16/09/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton



PROJECT	Lots 12 to 17 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 3 Vegetation Condition
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
Drawing Number	Figure 3	Drawn	PN
Revision	A	Checked	
Date	16/09/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

APPENDIX A – DEFINITIONS FOR SPECIES AND COMMUNITIES

Department of Parks and Wildlife

CONSERVATION CODES

For Western Australian Flora and Fauna

Specially protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T **Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950*, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR **Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN **Endangered species**

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU **Vulnerable species**

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX **Presumed extinct species**

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA **Migratory birds protected under an international agreement**

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Categories of Threatened Species pursuant to the Environment Protection and Biodiversity Conservation Act 1999

EPBC Act Category	Department of Environment and Energy Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically endangered	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Categories of Threatened Communities pursuant to the Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Critically Endangered	**(1) An ecological community is eligible to be included in the *critically endangered* category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.**
Endangered	**(2) An ecological community is eligible to be included in the *endangered* category at a particular time if, at that time:** **(a) it is not critically endangered; and** **(b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.**
Vulnerable	**(3) An ecological community is eligible to be included in the *vulnerable* category at a particular time if, at that time:** **(a) it is not critically endangered nor endangered; and** **(b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.**

APPENDIX B – SPECIES LIST

NB: * indicates introduced flora

Family	Taxon name	Non-native
Iridaceae	*Romulea rosea var. australis*	*
Juncaceae	*Juncus kraussii*	
Cyperaceae	*Carex divisa*	*
Poaceae	*Avena barbata*	*
	Briza maxima	*
	Bromus diandrus	*
	Cynodon dactylon	*
	Lolium rigidum	*
	Pennisetum clandestinum	*
	Sporobolus africanus	*
	Vulpia bromoides	*
Fabaceae	*Lotus subbiflorus*	*
	Ornithopus compressus	*
	Medicago polymorpha	*
Myrtaceae	*Agonis flexuosa*	
	Eucalyptus ?camaldulensis	*
Brassicaceae	*Brassica tournefortii*	*
Chenopodiaceae	*Chenopodiaceae sp.*	*
	Salicornia ?quinqueflora	
	Chenopodium album	*
Rubiaceae	*Sherardia arvensis*	*
Solanaceae	*Solanum linnaeanum*	*
	Solanum nigrum	*
Oleaceae	*Olea europaea subsp. europaea*	*
Asteraceae	*Arctotheca calendula*	*
	Cotula coronopifolia	*
	Hypochaeris glabra	*
	Sonchus oleraceus	*
	Senecio condylus	
	Sp. indet.	

APPENDIX C – PLOT DATA

Site Name	Q01
Latitude	-33.6157
Longitude	115.4263
Date	4/9/20
Plot size (m^2)	100
Topography	Flat
Relief	Flat
Slope (°)	0-5
Aspect	NA
Soil Colour	Grey
Soil Depth	>50 cm
Texture	Clay
Gravel Cover	
Fire Interval	>5
Graze Level	Medium
Disturbance	Medium
Vegetation Condition	Excellent
Strata 1 Cover	
Strata 2 Cover	
Strata 3 Cover	95
Strata 1 Height (m)	
Strata 2 Height (m)	
Strata 3 Height (m)	0.25
Strata 1 Dominants	
Strata 2 Dominants	
Strata 3 Dominants	*Salicornia ?quinqueflora*

Taxon	**Cover**
**Lolium rigidum*	0.5
Salicornia ?quinqueflora	35
Sp. indet.	55
Senecio condylus	0.1

Site Name	Q02
Latitude	-33.6148
Longitude	115.4259
Date	4/9/20
Plot size (m2)	100
Topography	Flat
Relief	Flat
Slope (o)	0-5
Aspect	NA
Soil Colour	Grey
Soil Depth	>50 cm
Texture	Clay
Gravel Cover	
Fire Interval	>5
Graze Level	Medium
Disturbance	Medium
Vegetation Condition	Excellent
Strata 1 Cover	
Strata 2 Cover	
Strata 3 Cover	95
Strata 1 Height (m)	
Strata 2 Height (m)	
Strata 3 Height (m)	0.25
Strata 1 Dominants	
Strata 2 Dominants	
Strata 3 Dominants	*Salicornia ?quinqueflora*

Taxon	**Cover**
Chenopodiaceae sp.	0.2
**Lolium rigidum*	5
Salicornia? quinqueflora	75
Sp. indet.	15

Site Name	Q03
Latitude	-33.6161
Longitude	115.4246
Date	4/9/20
Plot size (m2)	100
Topography	Flat
Relief	Flat
Slope (o)	0-5
Aspect	NA
Soil Colour	Grey
Soil Depth	>50 cm
Texture	Clay
Gravel Cover	
Fire Interval	>5
Graze Lvel	Medium
Disturbance	Medium
Vegetation Condition	Excellent
Strata 1 Cover	
Strata 2 Cover	
Strata 3 Cover	95
Strata 1 Height (m)	
Strata 2 Height (m)	
Strata 3 Height (m)	0.25
Strata 1 Dominants	
Strata 2 Dominants	
Strata 3 Dominants	*Salicornia ?quinqueflora*

Taxon	**Cover**
Chenopodiaceae sp.	0.5
Juncus kraussii	1
Salicornia ?quinqueflora	70
Sp. indet.	5
**Vulpia bromoides*	10

Site Name	Q04
Latitude	-33.6187
Longitude	115.4259
Date	4/9/20
Plot size (m2)	100
Topography	Flat
Relief	Flat
Slope (o)	0-5
Aspect	NA
Soil Colour	Grey
Soil Depth	>50 cm
Texture	Clay
Gravel Cover	
Fire Interval	>5
Graze Lvel	Medium
Disturbance	Medium
Vegetation Condition	Excellent
Strata 1 Cover	
Strata 2 Cover	
Strata 3 Cover	95
Strata 1 Height (m)	
Strata 2 Height (m)	
Strata 3 Height (m)	0.25
Strata 1 Dominants	
Strata 2 Dominants	
Strata 3 Dominants	*Salicornia ?quinqueflora*

Taxon	**Cover**
**Cotula coronopifolia*	5
Chenopodiaceae sp.	0.3
Salicornia ?quinqueflora	80
Sp. indet.	5

Site Name	Q05
Latitude	-33.6172
Longitude	115.4237
Date	4/9/20
Plot size (m2)	100
Topography	Flat
Relief	Flat
Slope (o)	0-5
Aspect	NA
Soil Colour	Grey
Soil Depth	>50 cm
Texture	Clay
Gravel Cover	
Fire Interval	>5
Graze Lvel	High
Disturbance	Medium
Vegetation Condition	Degraded
Strata 1 Cover	
Strata 2 Cover	
Strata 3 Cover	95
Strata 1 Height (m)	
Strata 2 Height (m)	
Strata 3 Height (m)	0.25
Strata 1 Dominants	
Strata 2 Dominants	
Strata 3 Dominants	*Salicornia ?quinqueflora, *Carex divisa, *Sporobolus africanus*

Taxon	**Cover**
Chenopodiaceae sp.	0.1
**Lolium rigidum*	1
Salicornia ?quinqueflora	15
Sp. indet.	10
**Carex divisa*	10
**Sonchus oleraceus*	0.1
**Sporobolus africanus*	15
**Vulpia bromoides*	25
Senecio condylus	0.1

APPENDIX B – DESKTOP ENVIRONMENTAL IMPACT ASSESSMENT – LOT 13 FORREST BEACH ROAD

accendo AUSTRALIA

STATEMENT OF ENVIRONMENTAL EFFECTS REPORT

LOT 13 FORREST BEACH ROAD, WONNERUP

NOVEMBER 2020

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Version	Date	Author	Reviewer
V1	04/11/2020	KMT	AJM
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Filename	2041_Lot 13 Forrest Beach Rd_v1		

Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

This report is strictly limited to the matters stated in it and is not to be read as extending, to any other matter in connection with the matters addressed in it.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

EXECUTIVE SUMMARY

The proponent (Wonnerup Group Pty Ltd) is seeking to develop a building envelope and associated infrastructure on Lot 13 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 2.16 ha in size and is located in the municipality of the City of Busselton.

The purpose of this Statement of Environmental Effects Report is to demonstrate that all environmental values are understood, and potential impacts associated with the future land use can be managed in accordance with legislative and policy requirements.

The proposed works entail the construction of a building envelope for a single residential dwelling within the subject site. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling.

The relevant environmental attributes and values of the subject site are summarised as follows:

- The subject site has been historically cleared or modified to allow for agricultural activities, primarily grazing.
- The subject site is classified as having a 'high to moderate risk' of acid sulfate soils occurring within 3 m of the natural soil.
- The *Geomorphic Wetlands of the Swan Coastal Plai*n dataset indicates that the subject site is contained within an area mapped as a Multiple Use (MU) wetland (UFI 13,208). The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and borders the eastern extent of the subject site.
- No threatened or priority flora species or vegetation communities have been identified within the subject site, nor are any likely to occur based on the degraded nature of vegetation (Accendo 2020).
- The coastal saltmarsh vegetation community within the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh', which is listed as a Threatened Ecological Community (TEC) under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019).
- The subject site contains habitat for migratory and other waterbird species.
- One registered Aboriginal heritage site is mapped over the subject site.

The design of the proposed development has responded to site-specific environmental constraints as far as practicable. This has been achieved with the following avoidance and management measures:

- Avoidance Measures:
    - Provision of a 100 m setback from the effluent disposal area to the Ramsar wetland.
    - Provision of a 62 m setback from the effluent disposal area to the CC wetland.
    - Minor direct impact to the coastal saltmarsh vegetation community TEC.
- Management Measures:
    - Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
    - To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May);
    - Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free;

- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands;
- Implement weed and disease management measures including;
  - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite;
  - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and
  - Weed free fill is to be used for on-site earthworks.

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1 INTRODUCTION

1.1 Background

The proponent (Wonnerup Group Pty Ltd) is seeking to develop a building envelope and associated infrastructure on Lot 13 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 2.16 hectares (ha) in size and is located in the municipality of the City of Busselton. It is situated approximately 8 kilometres (km) north of the Busselton Central Business District (refer to **Figure 1**).

1.2 Scope and Purpose

The purpose of this Statement of Environmental Effects Report is to demonstrate that all environmental values are understood and potential impacts associated with the future land use can be managed in accordance with legislative and policy requirements, and have been adequately considered in the design of the development.

Specifically, this Report has been developed with the intent of satisfying the requirements specified in Schedule 6 of the City of Busselton's *Local Planning Scheme No. 21*.

1.3 Proposed Development

The proposed works entail the construction of a building envelope for a single residential dwelling within the subject site. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling. The sand pad will be constructed to a height of 3.0 m Australian Height Datum (AHD), with this area comprising 1,000 m^2 (25 m x 40 m). With the addition of batters, the total footprint of the sand pad will be 2,000 m^2 (40 m x 50 m). An onsite effluent disposal area of 150 m^2 has been included within the 1,000 m^2 footprint. The 3 m wide driveway will traverse an area which is subject to seasonal inundation and therefore a box culvert (1,200 mm wide by 450 mm high) will be laid in the lowest lying part of the waterway.

No further subdivision or rezoning of the existing lot is proposed.

The subject site is zoned 'Conservation' pursuant to the City of Busselton's *Local Planning Scheme No. 21*. Both 'Single House' and 'Home Occupation' are permitted uses within this zone.

2 LEGISLATION, POLICY AND GUIDELINES

The following legislation, policy and guidelines have been considered and will guide the required and expected management outcome from Federal, State and local government agencies.

2.1 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation.

The EPBC Act aims to protect Matters of National Environmental Significance. Under the EPBC Act, the Commonwealth Department of Agriculture, Water and Environment (DAWE) lists Threatened species, Migratory species and Threatened Ecological Communities (TECs) in certain categories determined by criteria provided within the EPBC Act.

Under the EPBC Act, a significant impact is determined by the sensitivity, value and quality of the environment which is to be impacted and the intensity, duration, magnitude and geographic extent of the impacts (DEWHA 2008). If a proposed action is deemed to have a significant impact, this action should be referred to the Minister for formal assessment.

2.2 Western Australian Legislation

This desktop assessment has been undertaken in consideration of the relevant Western Australian state legislation which includes the following.

Biodiversity Conservation Act 2016 (BC Act)

The Department of Biodiversity Conservation and Attractions (DBCA) lists flora and fauna taxa under the provisions of the BC Act as protected according to their need for protection. Flora is given Declared Rare status when their populations are geographically restricted or are threatened by local processes. In addition, under the BC Act, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora and fauna is protected throughout the State.

Environmental Protection Act 1986 (EP Act)

This EP Act is administered by the Department of Water and Environmental Regulation (DWER) and DBCA. The EP Act provides for conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with it. The Act establishes head powers to provide mechanisms for the development of Environmental Protection Policies (EPP), the referral and assessment of proposals (Environmental Impact Assessment), the control of pollution and enforcement. The Act also provides for an Environmental Protection Authority (EPA) that is a statutory authority and is the primary provider of independent environmental advice to Government. The EPA is assisted by the EPA Service Unit comprising the Environmental Impact Assessment and Policy Divisions of the DWER.

3 BIOPHYSICAL ENVIRONMENT

3.1 Land Use

Historically, the subject site has been used for broad acre agriculture. The current owners utilise the property for cattle grazing. Accordingly, the subject site has been modified, consisting of predominately paddock grasses with native vegetation restricted to an ephemeral watercourse containing Chenopodiaceae sp., *Salicornia quinqueflora* and *Senecio condyles*.

The subject site is bounded to the north by Lot 12, to the east by Lot 17, to the south by Conservation zoned lots and Forrest Beach Road to the west.

The land use surrounding the subject site is predominately associated with Rural, Rural- Residential and Conservation lots.

3.2 Topography

Site survey indicates that the topography of the subject site ranges from 0.5 m AHD and 1 m AHD, generally increasing towards the road and the north east boundary. The adjacent Forrest Beach Road is typically at a level of 1.5 m AHD.

3.3 Landform and Soils

The subject site is located on the western edge of the Swan Coastal Plain, along the south-eastern shores of Geographe Bay. The Swan Coastal Plain is characterised by a generally subdued topography formed almost entirely of river (fluvial) and windblown (aeolian) depositional material and arranged in a sequence of four parallel main geomorphic units: Quindalup Dune System, Spearwood Dune System, Bassendean Dune System and Pinjarra Plain (WAPC 2005).

Regional soil mapping prepared by the Department of Agriculture and Food Western Australia (DAFWA) indicates that the subject site is located within the Vasse Land System and the Vasse-Wonnerup wet flats Phase (DAFWA 2012). This soil sub-system is characterised as poorly drained flats around the edge of the Vasse Estuary, with dark calcareous sands and mixed estuarine deposits.

3.4 Acid Sulfate Soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. ASS can pose issues when oxidised, producing sulphuric acid, which can present a range of risks for the surrounding environment, infrastructure and human health.

The Department of Water and Environment Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2019). A review of the DWER mapping indicates that the subject site is classified as having a 'high to moderate risk' of ASS occurring within 3 m of the natural soil.

3.5 Groundwater

The subject site is located within the Busselton - Capel groundwater area as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The catchment is underlain by the Superficial aquifer, which is approximately 10 m thick. Below this lies the Leederville aquifer, which in turn is underlain by the older

and larger Yarragadee aquifer. Both the Leederville and Yarragadee are confined aquifers that are recharged by direct infiltration of rainfall on the Blackwood Plateau. In thickness the Leederville aquifer varies from 50 m in the west to approximately 500 m in the east, while the Yarragadee aquifer ranges from 600 m to 1,600 m. All three of these aquifers flow towards the coast (WAWA 1995).

The DWER's Water Information Reporting Tool indicates that a Busselton shallow bore (BN9S) is located approximately 300 m north of the subject site. Records from this groundwater monitoring bore indicate that during the month of September, groundwater levels ranged from 0.15 m AHD to 0.675 m AHD from 2005 to 2019, with an average of 0.35 m AHD during this period.

3.6 Hydrology

The Malbup River is located approximately 100 m east of the subject site. This watercourse is associated with the Vasse-Wonnerup wetlands which is listed as a Wetland of International Importance under the Ramsar *Convention on Wetlands*.

Wetlands within Western Australia are classified on the basis of landform and water permanence pursuant to the Semeniuk (1995) classification system (refer to **Table 1**).

Table 1. Wetland classifications (Semeniuk 1995).

Water Longevity	Landform				
	Basin	Channel	Flat	Slope	Highland
Permanent Inundation	Lake	River	-	-	-
Seasonal Inundation	Sumpland	Creek	Floodplain	-	-
Intermittent Inundation	Playa	Wadi	Barlkarra	-	-
Seasonal Waterlogging	Dampland	Trough	Palusplain	Paluslope	Palusmont

Areas of wetlands have been mapped previously by Semenuik (1995) across the entire Swan Coastal Plain. This mapping has been converted into a digital dataset that is maintained by the DBCA and is referred to as the '*Geomorphic Wetland of the Swan Coastal Plain*' dataset. This dataset contains information on geomorphic wetland types and assigns management categories that guide the recommended management approach for each wetland area. The wetland management categories and management objectives are listed in **Table 2**.

Table 2. DBCA wetland management categories (Semeniuk 1995).

Category	Description	Management Objectives
Conservation	Wetlands support a high level of ecological attributes and functions.	Highest priority wetlands. Objective is to preserve and protect the existing conservation values of the wetlands through various mechanisms including: • Reservation in national parks, crown reserves and State owned land, • Protection under Environmental Protection Policies, and • Wetland covenanting by landowners. No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.

Category	Description	Management Objectives
Resource Enhancement	Wetlands which may have been partially modified but still support substantial ecological attributes and functions	Priority wetlands. Ultimate objective is to manage, restore and protect towards improving their conservation value. These wetlands have the potential to be restored to Conservation category. This can be achieved by restoring wetland function, structure and biodiversity.
Multiple Use	Wetlands with few remaining attributes and functions	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare.

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset indicates that the subject site is contained within an area mapped as a Multiple Use (MU) wetland (UFI 13,208).

The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and is located to the east of the subject site (refer to **Figure 2**).

Flood mapping prepared by the DWER demonstrates that the subject site is located within the flood fringe (DWER 2015) (refer to **Figure 3**).

3.7 Vegetation and Flora

3.7.1 Flora

A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020 within the subject site. A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera (Accendo 2020).

No Threatened Flora pursuant to the *Biodiversity Conservation Act 2016* (BC Act) nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey (Accendo 2020).

3.7.2 Vegetation

Mapping of vegetation complexes for the Swan Coastal Plain places the subject site within the Vasse vegetation complex, which is described as a mixture of the closed scrub of *Melaleuca* species, fringing *Eucalyptus rudis* – Melaleuca species woodlands, as well as tuart – jarrah – marri open forests. South of the Capel River, it also includes areas dominated by *Tecticornia* and *Salicornia* species (Webb *et al.* 2016). The *Swan Coastal Plain Vegetation Complex Statistics Report* (Webb *et al.* 2016) states that 4,924 ha of the complex remains, representing over 31% of its original pre-European extent with 13% protected in the reserve system.

During the flora and vegetation survey, vegetation within the subject site was described as cultivated pasture intersected by areas of the coastal saltmarsh vegetation community. The pasture grasses include **Lolium rigidum, *Avena barbata* and **Bromus diandrus.* Other exotic taxa in the pastured areas include **Solanum linnaeanum, *Ornithopus compressus, *Lotus subbiflorus* and **Romulea rosea* var. *australis* (Accendo 2020).

The coastal saltmarsh vegetation community within the subject site is dominated by *Salicornia quinqueflora*. Associated species include *Senecio condylus*, **Lolium rigidum*, a Chenopodiaceae species and another unidentifiable monocot species (Accendo 2020). The coastal saltmarsh vegetation community is in 'Excellent' condition, with only a minor presence of weeds.

The remainder of the subject site is in a 'Completely Degraded' condition as it has lost much of its original natural botanical value from its conversion to agricultural pasture (refer to **Figure 4**).

Threatened Ecological Communities

The coastal saltmarsh vegetation community within the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh' community, which is listed as a TEC under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019).

A key criterion to be considered part of the TEC is a continuous or intermittent saltwater influence. The Wonnerup surge barrier, which is located nearby and downstream of the subject site, prevents flooding of low-lying land during winter storms and restricts connection to the ocean during this period. However, fish gates are opened during summer to allow saltwater to enter the estuary to inhibit the formation of algal blooms (DWER 2018). During this period, the saltmarshes within the subject site are subject to some saltwater influences from the ocean.

3.7.3 Environmentally Sensitive Areas

Section 51B of the EP Act allows the Minister to declare an Environmentally Sensitive Area (ESA). Once declared, the exemptions to clear native vegetation under the regulations do not apply in these areas. TECs, areas within 50 m of any Declared Rare Flora and defined wetland areas constitute ESAs. However, a number of other areas of environmental significance are also listed. Current declared ESAs are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

The subject site, in addition to the wetland area spanning from Peppermint Grove to West Busselton, is located within an ESA. This mapping is attributed to proximity to the Vasse-Wonnerup wetland, a Ramsar and CC wetland.

3.8 Fauna

3.8.1 Fauna of Conservation Significance

A search of the DBCA's Threatened Fauna database was undertaken to establish whether species declared as 'Rare or likely to become extinct' (Schedule 1), 'Birds protected under an international agreement' (Schedule 3) and 'Other specially protected fauna' (Schedule 4) as listed under the *Biodiversity Conservation Act 2016* have been recorded in proximity to the subject site. The NatureMap Report identified four Threatened fauna species, two Priority 4 fauna species, eight fauna species protected under international agreement and one other specially protected fauna species as occurring within 2 km of the subject site (refer to **Table 3**).

The EPBC Act Protected Matters Search Tool (PMST) also identified several Threatened and Migratory species that could potentially occur within or in proximity to the subject site. This included three species classified as Vulnerable, two Endangered species, one Critically Endangered species and 20 Migratory bird species (refer **Table 3**).

The DBCA database search results are based on recorded occurrences of individuals and therefore are considered more accurate than the PMST results which are typically a product of modelled distributions of species.

The likelihood of each of the fauna species occurring within the subject site is shown in **Table 3** below. The Threatened/Migratory marine species have been excluded from the likelihood table as the subject site is not directly connected to the ocean.

The conservation significant fauna species considered likely to occur within the subject site are waders and waterbirds. This is on the basis that fauna habitat within the subject site is exclusively restricted to the coastal saltmarsh vegetation community TEC. It is also noted that the Vasse-Wonnerup wetland provides habitat for more than 30,000 waterbirds, being one of the most significant waterbird habitats in Western Australia.

Table 3. Significant fauna potentially occurring within the subject site as identified by State and Commonwealth database searches.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Apus pacificus subsp. *pacificus* (Fork-tailed Swift)	IA	Migratory	Unlikely. No records of the species occurring in the area.
Actitis hypoleucos (Common Sandpiper)	IA	Migratory	Likely. The species is found in a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. May utilize area associated with the coastal saltmarsh vegetation community.
Ardea ibis (Cattle Egret)	IA	Migratory	Likely. This species is widely distributed in a wide range of wetland habitats and usually frequents shallow waters. May utilize area associated with the coastal saltmarsh vegetation community.
Ardea modesta (Eastern Great Egret)	IA	Migratory	
Ardea alba (Great Egret)	IA	Migratory	
Anous tenuirostris melanops (Australian Lesser Noddy)	S1	Vulnerable	Unlikely. Lack of suitable habitat within the subject site.
Botaurus poiciloptilus (Australasian Bittern)	S1	Endangered	Unlikely. No suitable habitat (i.e. absence of tall reeds and sedges).
Calidris acuminata (Sharp-tailed Sandpiper)	IA	Migratory	Possible. The species is known to occur inland in saline environments.
Calidris canutus (Red knot)	S1	Endangered	Unlikely. No records of the species occurring in the locality.
Calidris canutus (Red-necked Stint)	IA	Migratory	Likely. Known to forage on intertidal flats in the locality.
Charadrius bicinctus (Double-banded Plover)	IA	Migratory	Unlikely. Not found within the locality.
Charadrius ruficapilluss (Red-capped Plover)	IA	Migratory	Likely. The species is known to inhabit estuarine habitats.
Falco peregrinus (Peregrine Falcon)	S	-	Possible. This species is found in a wide variety of habitats.
Haliaeetus leucogaster (White-bellied Sea Eagle)	IA	Migratory	Possible. This species is found in coastal habitats and terrestrial wetlands. They are known to occur in estuaries.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Hydroprogne caspia (Caspian Tern)	IA	Migratory	Unlikely. Not found within the locality.
Limosa lapponica (Bar-tailed Godwit)	IA	Migratory	Unlikely. Not found within the locality.
Isoodon obesulus subsp. fusciventer (Quenda)	P4	-	Unlikely. Absence of suitable habitat.
Merops ornatus (Rainbow Bee-eater)	IA	Migratory	Possible. Found in a wide variety of habitats, often near permanent water. Unlikely to rely on the subject site for habitat.
Motacilla cinereal (Grey wagtail)	IA	Migratory	Unlikely. Not found within the locality.
Numenius madagascariensis (Eastern Curlew)	S1	Critically Endangered	Unlikely. Not found within the locality.
Oxyura australis (Blue-billed Duck)	P4	-	Possible. Known to occur in fresh to saline wetlands that may be artificial. May utilize area associated with the coastal saltmarsh vegetation community.
Pandion haliaetus (Osprey)	IA	Migratory	Unlikely. Not found within the locality.
Pseudocheirus occidentalis (Western Ringtail Possum)	S1	Vulnerable	Unlikely. No suitable habitat.
Thalasseus bergii (Crested Tern)	IA	Migratory	Unlikely. Not found within the locality.
Thinornis rubricollis (Hooded Plover)	P4	Migratory	Possible. Known to occur inland from the edges of lakes, on nearby grassy freshwater seepages, and in estuaries.
Tringa glareola (Wood Sandpiper)	IA	Migratory	Likely. The species is typically found in well vegetated, freshwater wetlands dominated by tall fringing vegetation. It is rarely found in brackish wetlands. It is known to use artificial wetlands. Known to occur in the Vasse-Wonnerup estuary.
Tringa nebularia (Common Greenshank, greenshank)	IA	Migratory	Likely. The species is found in a wide variety of inland waters and sheltered coastal habitat of varying salinity. It is known to use artificial wetlands. May utilize area associated with the coastal saltmarsh vegetation community.
Tringa stagnatilis (Marsh Sandpiper)	IA	Migratory	Unlikely. Not found within the locality.

Of the abovementioned species, eight migratory bird species are considered likely to occur within or adjacent (Vasse-Wonnerup wetlands) to the subject site. No threatened fauna species are considered likely to inhabit the subject site.

Habitat for migratory bird species within the subject site is restricted to the coastal saltmarsh vegetation community TEC. The pasture which constitutes the majority of the subject site does not provide habitat for

wetland fauna. Accordingly, waterbirds within the subject site may only occur as vagrants given the substantial area of coastal vegetation available in proximity to the subject site.

3.9 Aboriginal Heritage

All Aboriginal sites in Western Australia are provided protection under the *Aboriginal Heritage Act 1972* in which it is an offence for anyone to excavate, damage, destroy, conceal or in any way alter an Aboriginal site without the Minister's permission.

An online search for relevant Aboriginal heritage information was undertaken using the Department of Planning, Lands and Heritage (DPLH) Aboriginal Inquiry System that incorporates both the heritage site register and the heritage survey database (DPLH 2020). The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* and contains information on over 22,000 listed Aboriginal sites throughout Western Australia.

Results from the database search indicate that the subject site is mapped within the Other Heritage Place 4566 (Cable Sands Skull) (refer to **Figure 5**). Accordingly, it may be necessary to further liaise with the DPLH to determine the status and restrictions associated with the registered site.

Based on extent of disturbance (i.e. no ground disturbing works), it is not anticipated that this heritage listing represents a constraint to the proposed development.

4 POTENTIAL IMPACTS AND MANAGEMENT

During the process of undertaking this investigation, a range of specific environmental issues were explored in relation to the subject site and the proposed development. These issues arise from the proposed development, the existing environment of the subject site, its surrounds and the prevailing state and federal environment policy and legislation. The implications associated with the issues in the context of the intended development of the subject site are discussed in this Section.

4.1 Acid Sulfate Soils

The subject site is classified as having a high to moderate risk of ASS occurring within 3 m of the natural soil surface (DWER 2020). In an undisturbed state below the water table, these soils remain benign and non-acidic. However, if these soils are exposed to the atmosphere through drainage, excavation or dewatering, the sulfides may react with oxygen and form sulfuric acid.

4.1.1 Management Measures

The principal management objective for ASS within the subject site is to ensure that any future development that may disturb ASS is appropriately managed to avoid impacts on the environment.

The proposed building envelope is located outside of the mapped floodway, and within the flood fringe. Accordingly, clean fill will be imported to create a sand pad at a finished floor level of 3.0 m AHD for both the house and the effluent disposal area. This will provide significant clearance from the natural ground level denoting that excavation works below the natural ground level are not anticipated.

There will be no connections to underground services (i.e. power, reticulated water), with above-ground power provided to the dwelling. Furthermore, the proposed installation of culverts associated with the driveway will be undertaken in a manner whereby excavations will be limited or not required, to reduce impacts to remnant native vegetation.

On this basis, there are not expected to be any disturbances to potential ASS material.

4.2 Wetlands

The EPA's objective for inland waters is '*to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*' (EPA 2018).

The subject site is bordered to the north by a Conservation Category and Ramsar wetland, namely the Vasse-Wonnerup wetland.

4.2.1 Management Measures

The buffer adjoining a wetland helps to maintain the ecological processes and functions associated with the wetland, and aims to protect the wetland from potential adverse impacts. A buffer can also help to protect the community from potential nuisance insects. To maintain wetland values, it is important to determine, protect and manage an adequate buffer.

DBCA recommends a minimum 50 m buffer distance for Conservation Category wetlands that are to be protected (DPaW 2015). The 50 m buffer distance is considered to be generic and can be amended based on the values of the wetlands to be protected.

In consideration of the conservation significance of the Vasse-Wonnerup wetland and onsite constraints, site specific buffers have been formulated.

Accordingly, the proposed effluent disposal area and building envelope will be setback 62 m from the mapped boundary of the Conservation Category wetland, and 100 m from the mapped Ramsar wetland.

The subject site is contained within a mapped MU wetland. MU wetlands are assessed as possessing few remaining ecological attributes and functions. While such wetlands can still contribute to regional or landscape ecosystem management, including hydrological function, they are considered to have low intrinsic ecological value. Typically, they have minimal or no native vegetation remaining (less than 10%). Accordingly, there is no legislative requirement to protect or retain them and as such MU wetlands do not usually preclude development.

The management objective for MU wetlands is to preserve the hydrological functions in the context of the proposed development (EPA 2008). The proposed building envelope and driveway has been strategically located and designed to maintain existing hydrological functions, thereby complying with the management objectives associated with MU wetlands. Specifically, this includes the installation of suitably sized culverts for the proposed driveway where it traverses an ephemeral waterway, to minimise the impacts on the natural hydrology of the area. The hydrological regime will be maintained with the construction of culverts that will allow surface water to move across the landscape in patterns equal to current regimes. The design and installation of the culverts will ensure the surface water flows are maintained, including the hydraulic connectivity between areas of wetlands intersected/fragmented by the driveway.

The current water cycle on the subject site consists of inputs from rainwater being infiltrated on site. The development is not proposing to significantly alter this process, except for the importation of potable water to top up rainwater tanks, as required. The proposed development consists of a closed cycle, with rainwater water being captured on site and reinfiltrated via the proposed effluent disposal site.

In consideration of the above measures, there are not anticipated to be any direct impacts to wetlands of conservation significance as a result of the proposed development.

4.3 Wastewater Management

Effluent or domestic wastewater is derived from bathrooms, kitchens, laundries and toilets. It contains human waste (containing pathogens), paper, soap, detergent residues and food scraps (DoW 2010). The *Government Sewerage Policy* (DPLH 2019) provides a best practice approach for the provision of onsite sewage treatment and disposal.

It is understood that the subject site is not located on a reticulated water or wastewater supply network. Accordingly, onsite wastewater management will be required for the proposed building envelope.

The subject site is located within a sewage sensitive area (specifically within the estuary catchments on the Swan and Scott Coastal Plains) (DPLH 2019). In addition, the subject site is located within the specified area prescribed in the '*Vasse Wonnerup Wetlands and Geographe Bay Water Quality Improvement Plan, 2010*' (WQIP), specifically in the Sabina River catchment.

Pursuant to the WQIP, the Sabina River has been classified as a 'recovery' catchment, whereby waterways currently do not meet the water quality criteria of 0.1 mg/L for total phosphorus and 1.0 mg/L for total nitrogen. The management objectives for this catchment are to decrease median winter nitrogen and phosphorus concentrations to 1.0 mg/L and 0.1 mg/L, respectively. These water quality management objectives will require consideration when determining onsite effluent treatment and disposal requirements.

A *Site and Soil Evaluation* (WML 2020) was undertaken for the subject site to determine the capacity of the site for onsite effluent disposal in consideration of the *Government Sewerage Policy* (DPLH 2019). Several

options were considered for both the treatment system and land application area (LAA). Based on a site-specific investigation, it was recommended to treat the sewage wastewater to a secondary level using an Aerobic Treatment Unit (ATU) with nutrient removal by a suitable Department of Health (DOH)-approved treatment system. The treated wastewater shall then be applied to an elevated LAA via sub-surface drip irrigation (WML 2020).

In summary, the *Site and Soil Evaluation* (WML 2020) deemed onsite effluent disposal suitable pursuant to the *Government Sewerage Policy* (DPLH 2019) based on the following:

- Secondary treatment with nutrient removal of the sewage wastewater with an Aerobic Treatment Unit is required.
- A minimum LAA of 120 m^2 is required.
- The land application system should be comprised of sub- surface drip irrigation.
- Clay loam fill shall be imported for the LAA to provide a suitable soil for nutrient removal.
- The LAA should be bunded and sloped away from the wetland to prevent contamination from stormwater runoff.
- There are ongoing landowner obligations to ensure that operation and management of the treatment and disposal system is regularly maintained in accordance with relevant health regulations and manufacturer's recommendations.

4.3.1 Management Measures

Design specifications of the proposed secondary treatment system, including the location and discharge mechanisms (i.e. land application areas or discharge outlets) should be undertaken in accordance with the recommendations provided in the *Site and Soil Evaluation* (WML 2020). This assessment considers the specific site constraints present within the subject site including the estimated hydraulic and nutrient load, soil texture and category, and clearances to groundwater. Future Lot owners will be informed of these requirements prior to the purchase of the subject site and as part of development approval will need to apply to construct or install a wastewater treatment system.

4.4 Vegetation and Flora

The EPA objective for flora and vegetation is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*' (EPA 2016). Where a proposal may potentially impact upon flora and vegetation values, the following mitigation hierarchy should be applied to minimise potential impacts:

1. Avoid impacts.

2. Minimise impacts.

3. Offset impacts.

Construction of the proposed driveway will result in the removal of approximately 250 m^2 of native vegetation. This vegetation is comprised of the coastal saltmarsh vegetation community TEC/PEC. It is noted that the subject site contains a total of 0.45 ha of the coastal saltmarsh vegetation community TEC.

The Threatened Species Scientific Committee (TSSC) provides information on the estimated extent of the coastal saltmarsh vegetation community TEC within Western Australia. An assessment of the significance of the proposed clearing of the TEC within local and regional scales was made by comparing the extent within the clearing footprint to that published for the community (TSSC 2013).

The total extent of the coastal saltmarsh vegetation community TEC within Western Australia is estimated to be approximately 4,000 ha (TSSC 2013). The Swan Coastal Plain bio-geographic region contains the

largest areas of saltmarsh vegetation in Western Australia. On a local scale, the Broadwater and Vasse-Wonnerup wetland system, comprised of 900 ha of core wetlands (excluding floodplains), has been mapped by Tingay and Tingay (1980) as containing saltmarsh vegetation associated with the TEC.

Based on the above, the clearing of 250 m^2 of the coastal saltmarsh vegetation community TEC would result in a reduction of up to 0.0006% of the total estimated extent and less than 0.003% at a local scale. Within the subject site, this would equate to the removal of approximately 5% of the total extent of the coastal saltmarsh vegetation community TEC.

In consideration of the extent of the coastal saltmarsh vegetation community TEC at these scales and the area of clearing required for the proposed development, the impact of the clearing on this community is not considered to be significant.

Potential indirect impacts to native vegetation (particularly the coastal saltmarsh vegetation community TEC) are restricted to the increased risk of spread or introduction of weeds during construction works.

Indirect impact to the coastal saltmarsh vegetation community TEC from changes in hydrology are not expected, and accordingly, has not been listed above. Altering existing flow paths has the potential to negatively impact the hydrological regime (most notably drying) of the TEC occurrences. As discussed in **Section 4.2**, existing drainage patterns to adjacent TEC vegetation will be maintained. Impacts from changes to flow paths and or changes in hydrology are therefore not expected to result from the proposed development.

4.4.1 Management Measures

The configuration of the building envelope has been informed by the onsite flora and vegetation survey (Accendo 2020) to protect areas of increased environmental values, namely the coastal saltmarsh vegetation community TEC.

It is noted that within the DWER document *A guide to the assessment of applications to clear native vegetation* (2014), in reference to TECs it is stated that buffers should be determined on a case-by-case basis and in relation to the characteristics of the ecological communities being protected, and the surrounding land uses.

To avoid any direct impacts to the TEC whilst providing the greatest possible separation distance to the CC and Ramsar wetland, a 75 m setback will be provided from the land application area (associated with the onsite effluent disposal system) and the mapped TEC within the subject site.

Potential indirect impacts identified above can be appropriately managed in accordance with standard operational controls which will be documented within a Construction Environmental Management Plan (CEMP). The implementation of standard operational controls can be expected to appropriately control the risk of the introduction or spread of introduced flora taxa and as a minimum will include the following management measures:

- Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
- Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and
- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands.

The occurrence of the coastal saltmarsh vegetation community TEC remaining after the implementation of the proposed development will still meet the criteria for the TEC / PEC as per State and Commonwealth policies. The viability of this occurrences is considered unlikely to change as a result of the proposed development.

4.5 Fauna

This subject site is adjacent to the Vasse-Wonnerup wetlands which is of international importance for bird conservation for resident waterbirds and migratory shorebirds. In addition, the subject site contains an area of the coastal saltmarsh vegetation community which is recognised as an important feeding, roosting and refuge habitat for resident and migratory waterbirds.

The EPA's objective for terrestrial fauna is '*to protect fauna so that biological diversity and ecological integrity are maintained*' (EPA 2016). The application of the mitigation hierarchy has been applied to avoid or minimise impacts to terrestrial fauna where possible.

To access the building envelope, it is necessary for the driveway to traverse a small area of the coastal saltmarsh vegetation community which is known to provide habitat to waterbirds. The clearing of 250 m^2 of waterbird habitat is not expected to be significant given that 0.42 ha will be retained onsite and the adjoining Vasse-Wonnerup wetland system provides 900 ha of core wetland habitat.

Furthermore, to minimise indirect impacts, a 100 m setback from the proposed onsite effluent disposal area to the Ramsar wetland has been provided.

The proposed development may result in indirect impacts to fauna including:

- Incremental loss of fauna habitat (fragmentation, barrier effects and edge effects).
- Displacement of native fauna species due to increased noise.
- Displacement of native fauna species due to light spill.

4.5.1 Management Measures

In the context of the proposed single dwelling development within the subject site, the environmental aspects detailed in **Table 4** have been assessed in consideration of potential impacts to waterbirds.

Table 4. Potential impacts associated with waterbirds.

Impacts	Assessment	Outcome
Weed/disease spread	The spread or introduction of weeds is a risk associated with the construction of the driveway and building envelope. Changes to the floristic and structural nature of vegetation can reduce the habitat value. Within the subject site, it is noted that livestock grazing which is the current land use, has occurred over the past 100 years and has resulted in the vegetation not mapped as a TEC being in a 'completely degraded' condition. In consideration of the proposed setbacks and existing condition of the subject site, the addition of one new residential dwelling is unlikely to pose a significant risk	Potential risks associated with weed/disease spread will be further minimised by the development and implementation of weed hygiene measures prior to and during construction. This will include the following: - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite; - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate

Impacts	Assessment	Outcome
	to fauna in association with the spread/introduction of weeds.	waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and - Weed free fill is to be used for on-site earthworks. Weed/disease spread is expected to pose negligible risk to fauna.
Loss of habitat	Construction of the driveway will result in the loss of approximately 250 m^2 of potential habitat. This equates to a reduction of up to 0.0006% of the total estimated extent of the TEC in Western Australia, and less than 0.003% of the TEC at a local scale. Within the subject site, this would equate to the removal of approximately 5% of the total extent of the coastal saltmarsh vegetation community TEC. The impact of the clearing to potential waterbird habitat is not considered to be significant given the extent of potential habitat at a local scale and the potential area of clearing required for the driveway.	Given the availability of habitat at a local scale for wetland species, the loss of 250 m^2 of potential habitat is unlikely to have a significant impact on any wetland dependent species.
Alteration to water quality	The construction of the driveway will involve works including the clearing of native vegetation, construction earthworks and drainage construction. Each of these may have the potential to result in an increase in water turbidity (suspended sediments) and / or sedimentation within the watercourse located in the subject site. To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May).	Alteration to water quality is not expected to result in a significant impact to fauna from the proposed development, provided the driveway is constructed when the watercourse is dry.
Alteration of hydrological regimes	As discussed in **Section 4.2**, drainage design associated with the culverts for the driveway has sought to maintain the existing surface water hydrology, both within the subject site and surrounds. The sizing and design of surface water drainage structures for the driveway will be sufficient to maintain the existing	Alteration of hydrological regimes is not expected to result in a significant impact to fauna from the proposed development.

Impacts	Assessment	Outcome
	hydrological flows through the watercourse.	
Light spill	Artificial lighting from the residential dwelling may cause disturbance to some terrestrial fauna. Potential impacts are the alteration of foraging activity to bats, and changes in fauna assemblage in any areas affected by light spill. Lighting may also increase the availability of prey for adaptable bats and birds by attracting insects. Light spill from a single residential dwelling within the lot will be minimal. Furthermore, the residential dwelling will be setback 100m from the Ramsar wetland, denoting that light spill is very unlikely to impact fauna habitat areas within this wetland. It is noted that light spill may impact the areas containing the TEC adjacent to the building envelope. Any displacement impact from the proposed development would be limited to a small number of individuals. Further, such individuals are likely to move to other parts of their existing home ranges away from the building envelope location. Any displacement impact would therefore not be expected to result in indirect mortality of individuals, or displacement of waterbird individuals from their habitat entirely.	Light spill is not expected to result in a significant impact to fauna from the proposed development.
Introduction of non-endemic fauna	The introduction/increase in non-endemic fauna may lead to increased predation of waterbirds. One residential dwelling within the subject site is unlikely to significantly increase populations of non-endemic fauna.	The introduction/increase in non-endemic fauna is not expected to result in a significant impact to fauna from the proposed development.
Noise	Noise generated by machinery during construction has the potential to affect fauna. Construction noise may lead to avoidance of the area by fauna. It is known that some form of habituation occurs in response to repeated noise, whereby fauna simply maintain activities in their natural	Noise is not expected to result in a significant impact to fauna from the proposed development.

Impacts	Assessment	Outcome
	habitat after an initial period of acclimatisation. Given the short-term and localised nature of construction noise, it is anticipated that the impacts of noise on fauna will be negligible. Furthermore, the addition of one new residential dwelling, with considerable setbacks to the conservation significant wetlands will produce limited impacts to waterbirds. It is noted that noise may impact the areas containing the TEC adjacent to the building envelope. Any displacement impact from the proposed development would be limited to a small number of individuals. Further, such individuals are likely to move to other parts of their existing home ranges away from the building envelope location. Any displacement impact would therefore not be expected to result in indirect mortality of individuals, or displacement of waterbird individuals from their habitat entirely.	

The Vasse -Wonnerup Ramsar site comprises an area of 1,115 ha of waterbird habitat in secure conservation areas. The effect of the proposed development will be minimal at the broader scale represented by this reserve area. Therefore, the proposed development in itself is very unlikely to contribute significantly to a long-term reduction in the size of the populations of any of waterbird species of conservation significance.

5 CONCLUSION

The key environmental aspects associated with the subject site in the context of the proposed development include:

- ASS;
- Wetlands;
- Wastewater;
- Vegetation and flora; and
- Fauna.

The design of the proposed development has responded to site-specific environmental constraints as far as practicable. This has been achieved with the following avoidance and management measures:

- Avoidance Measures:
    - Provision of a 100 m setback from the effluent disposal area to the Ramsar wetland.
    - Provision of a 62 m setback from the effluent disposal area to the CC wetland.
    - Minor direct impact to the coastal saltmarsh vegetation community TEC.
- Management Measures:
    - Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
    - To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May);
    - Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free;
    - Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands;
    - Implement weed and disease management measures including;
        - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite;
        - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and
        - Weed free fill is to be used for on-site earthworks.

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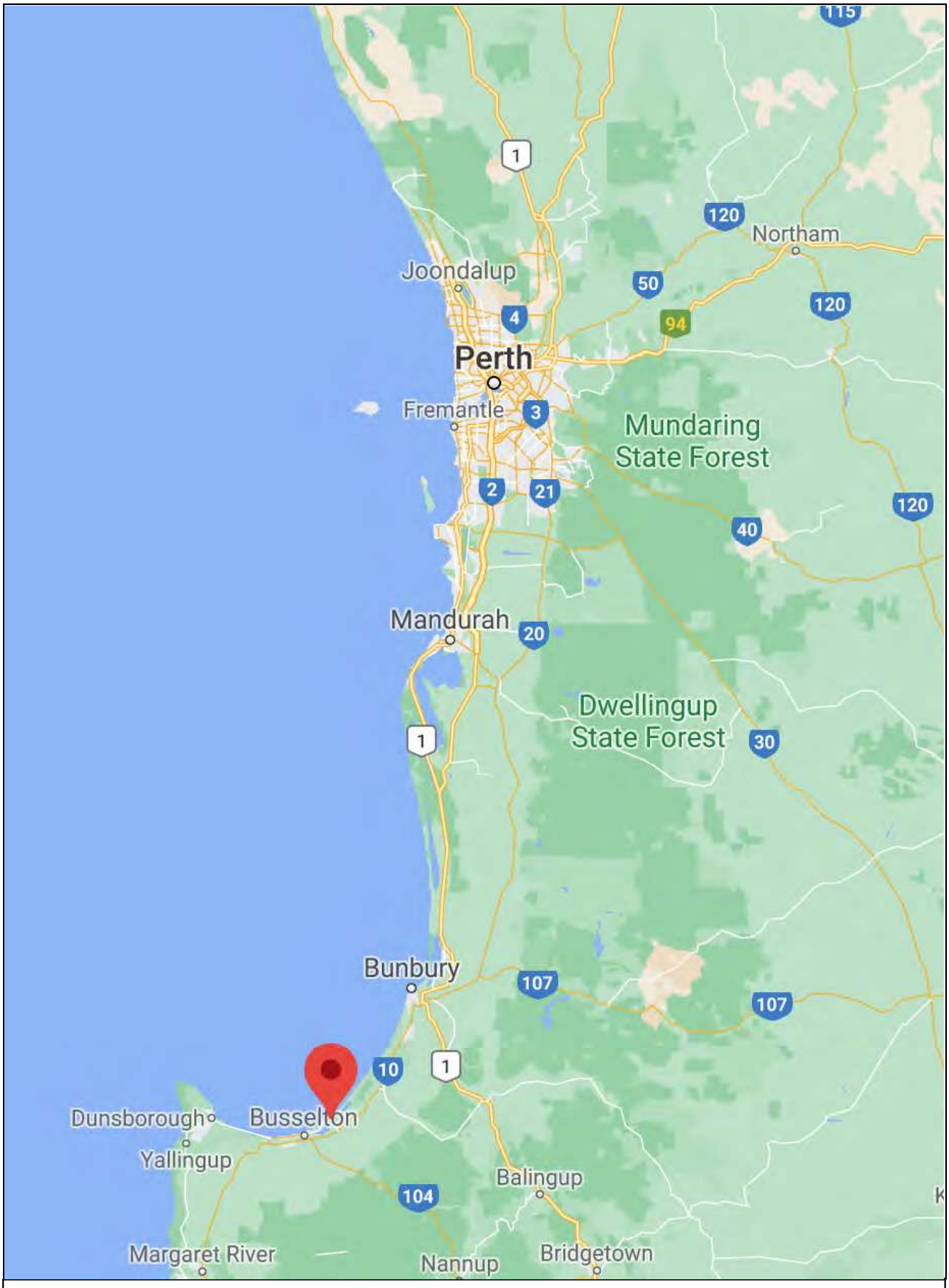
FIGURES



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		Drawn PN	Approved	
CLIENT	Wonnerup Group Pty Ltd	Date	1/10/2020	
		Local Authority	City of Busselton	
		Sheet 1 of 1		

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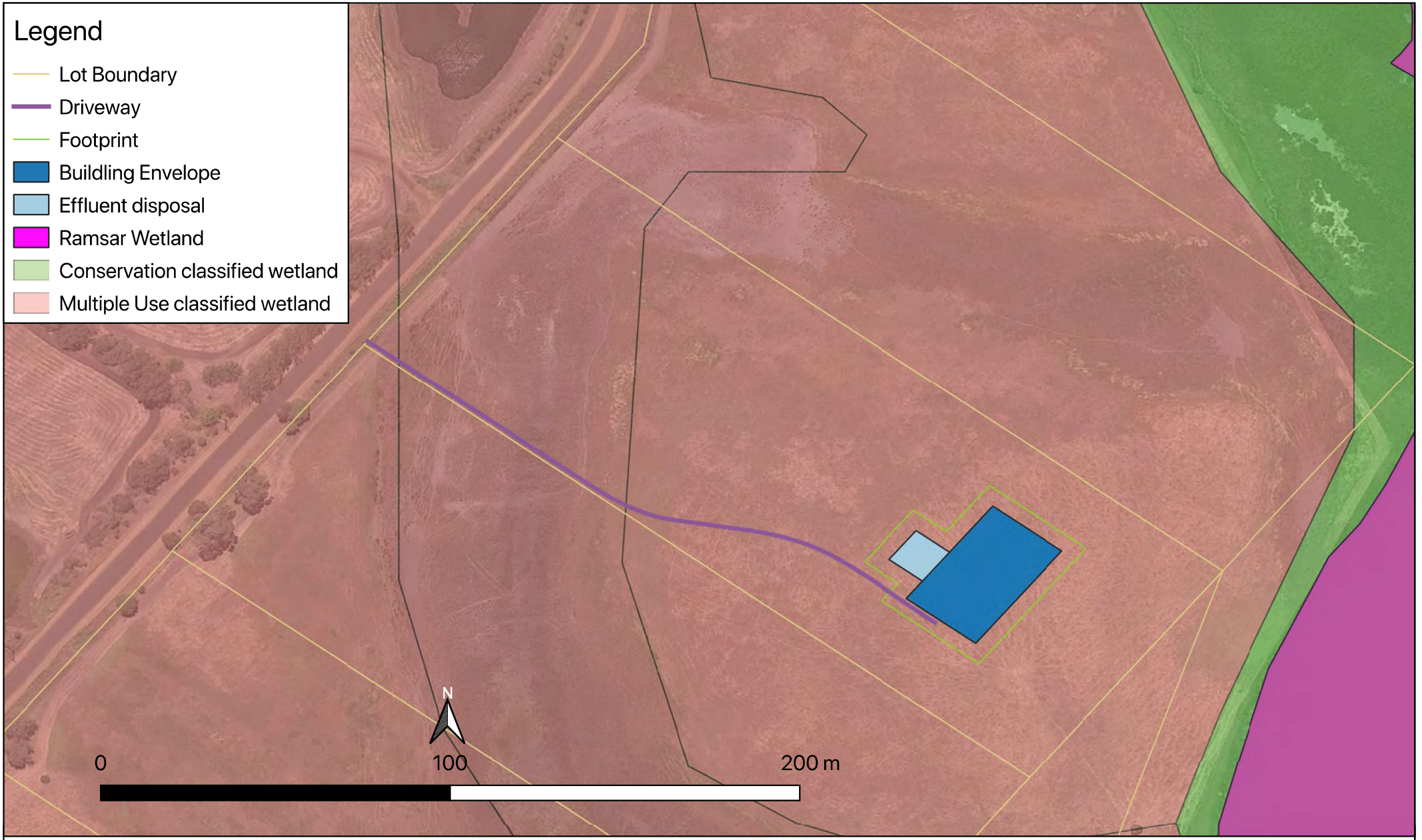

PROJECT Lot 13 Forrest Beach Road, Wonnerup

DRAWING TITLE Figure 2 Wetland Mapping

CLIENT Wonnerup Group Pty Ltd

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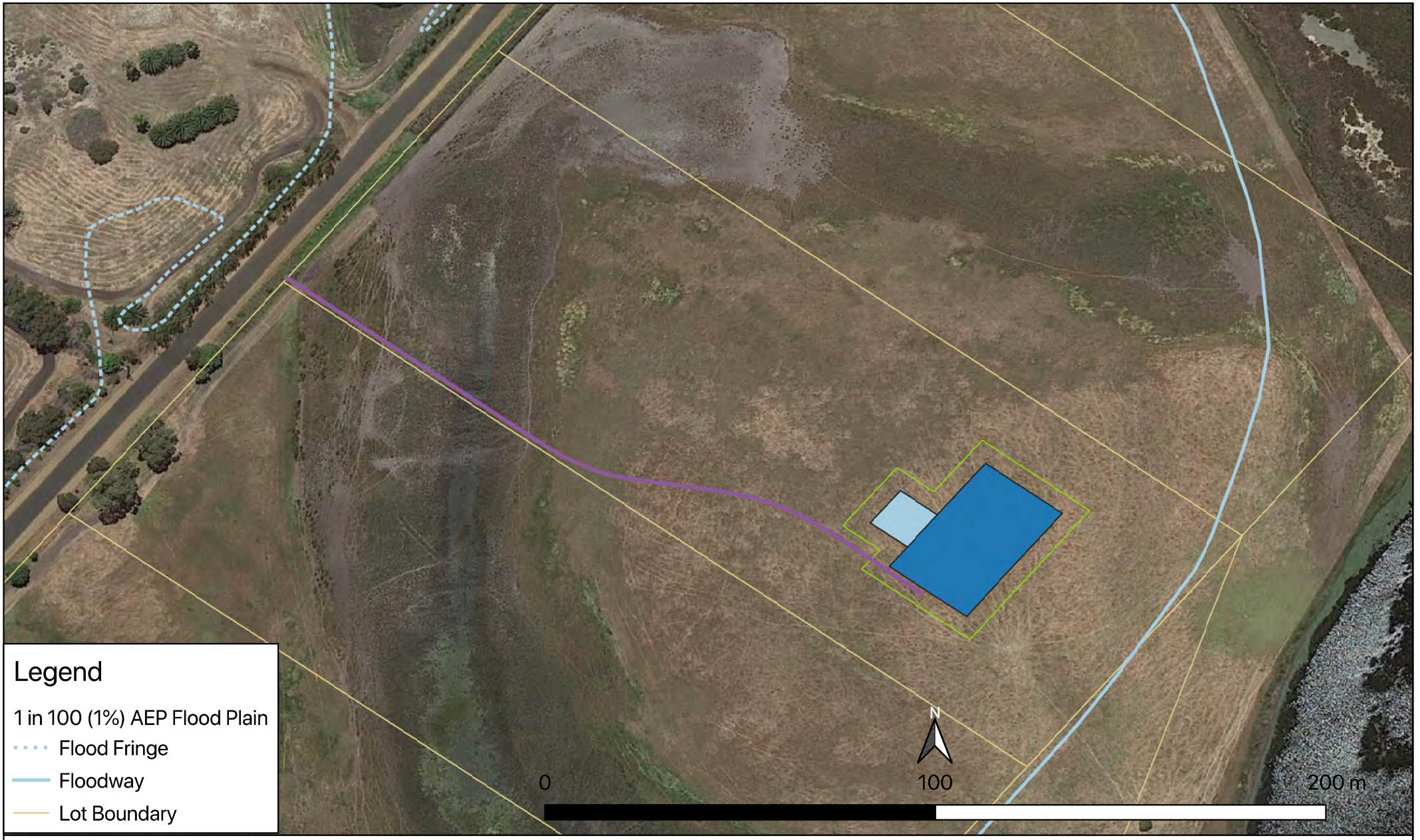
Project Number	2041	Designed	PN
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton



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DRAWING TITLE	Figure 3 Floodplain Mapping
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
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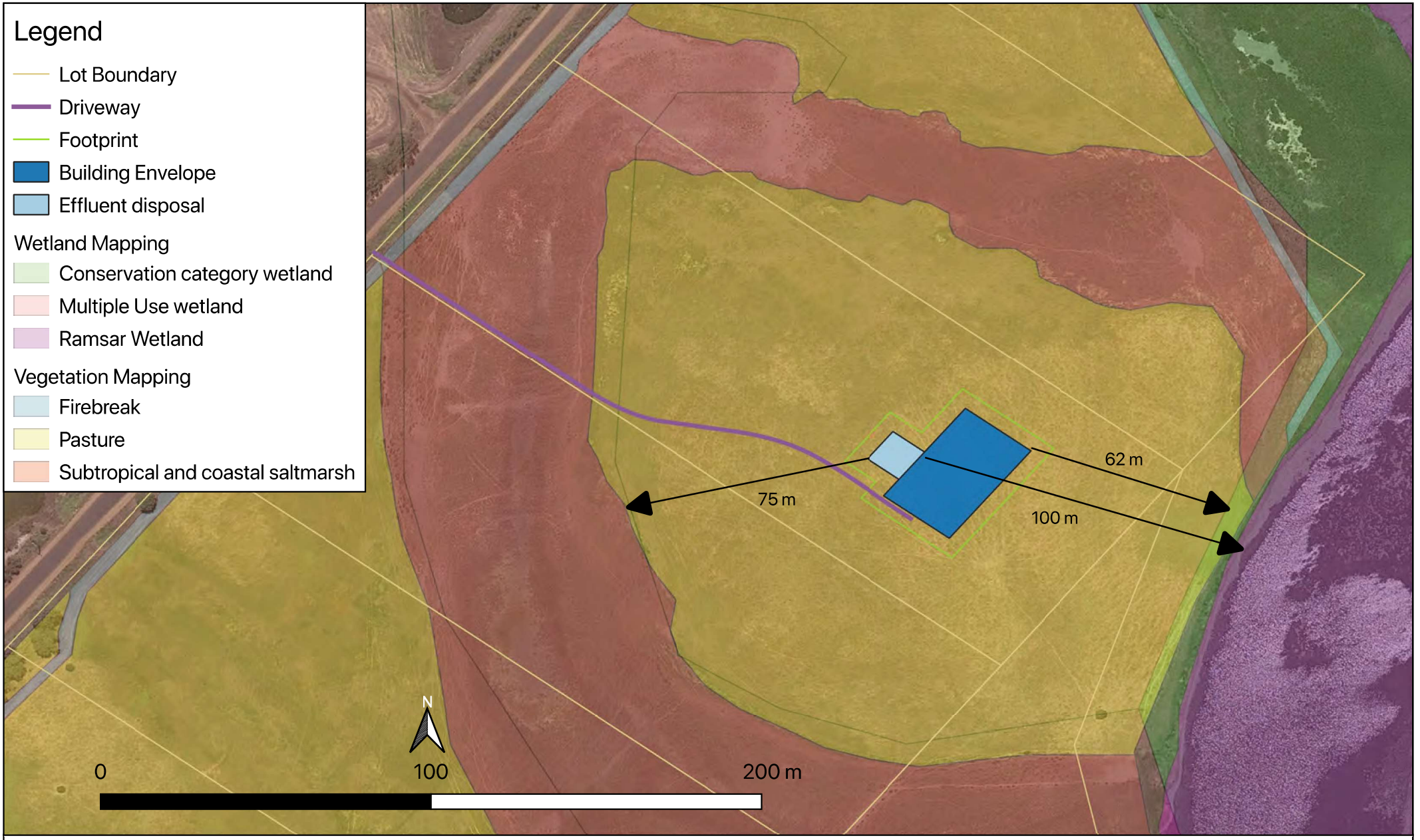
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton



PROJECT	Lot 13 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 4 Vegetation Mapping & Setback Distances
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
Drawing Number	Figure 4	Drawn	PN
Revision	A	Checked	
Date	8/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

PROJECT	Lot 13 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 5 Aboriginal Heritage Mapping
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
Drawing Number	Figure 5	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

APPENDIX C – DESKTOP ENVIRONMENTAL IMPACT ASSESSMENT – LOT 14 FORREST BEACH ROAD

STATEMENT OF ENVIRONMENTAL EFFECTS REPORT

LOT 14 FORREST BEACH ROAD, WONNERUP

NOVEMBER 2020

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Document Control

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V1	04/11/2020	KMT	AJM
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Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

This report is strictly limited to the matters stated in it and is not to be read as extending, to any other matter in connection with the matters addressed in it.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

EXECUTIVE SUMMARY

The proponent (Wonnerup Group Pty Ltd) is seeking to develop a building envelope and associated infrastructure on Lot 14 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 2.16 ha in size and is located in the municipality of the City of Busselton.

The purpose of this Statement of Environmental Effects Report is to demonstrate that all environmental values are understood, and potential impacts associated with the future land use can be managed in accordance with legislative and policy requirements.

The proposed works entail the construction of a building envelope for a single residential dwelling within the subject site. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling.

The relevant environmental attributes and values of the subject site are summarised as follows:

- The subject site has been historically cleared and modified to allow for agricultural activities, primarily grazing.
- The subject site is classified as having a 'high to moderate risk' of acid sulfate soils occurring within 3 m of the natural soil.
- The *Geomorphic Wetlands of the Swan Coastal Plai*n dataset indicates that the subject site is contained within an area mapped as a Multiple Use (MU) wetland (UFI 13,208). The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and is located to the east of the subject site.
- No threatened or priority flora species or vegetation communities have been identified within the subject site, nor are any likely to occur based on the degraded nature of vegetation (Accendo 2020).
- The coastal saltmarsh vegetation community within the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh', which is listed as a Threatened Ecological Community (TEC) under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019).
- The subject site contains habitat for migratory and other waterbird species.
- One registered Aboriginal heritage site is mapped over the subject site.

The design of the proposed development has responded to site-specific environmental constraints as far as practicable. This has been achieved with the following avoidance and management measures:

- Avoidance Measures:
    - Provision of a 108 m setback from the building envelope to the Ramsar wetland.
    - Provision of a 80 m setback from the effluent disposal area to the CC wetland.
    - Minor direct impact to the coastal saltmarsh vegetation community TEC.
- Management Measures:
    - Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
    - To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May);
    - Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free;

- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands;
- Implement weed and disease management measures including;
  - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite;
  - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and
  - Weed free fill is to be used for on-site earthworks.

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1 INTRODUCTION

1.1 Background

The proponent (Wonnerup Group Pty Ltd) is seeking to develop a building envelope and associated infrastructure on Lot 14 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 2.16 hectares (ha) in size and is located in the municipality of the City of Busselton. It is situated approximately 8 kilometres (km) north of the Busselton Central Business District (refer to **Figure 1**).

1.2 Scope and Purpose

The purpose of this Statement of Environmental Effects Report is to demonstrate that all environmental values are understood and potential impacts associated with the future land use can be managed in accordance with legislative and policy requirements, and have been adequately considered in the design of the development.

Specifically, this Report has been developed with the intent of satisfying the requirements specified in Schedule 6 of the City of Busselton's *Local Planning Scheme No. 21*.

1.3 Proposed Development

The proposed works entail the construction of a building envelope for a single residential dwelling within the subject site. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling. The sand pad will be constructed to a height of 3.0 m Australian Height Datum (AHD), with this area comprising 1,000 m^2 (25 m x 40 m). With the addition of batters, the total footprint of the sand pad will be 2,000 m^2 (40 m x 50 m). An onsite effluent disposal area of 150 m^2 has been included within the 1,000 m^2 footprint. The 3 m wide driveway will traverse an area which is subject to seasonal inundation and therefore a box culvert (1,200 mm wide by 450 mm high) will be laid in the lowest lying part of the waterway.

No further subdivision or rezoning of the existing lot is proposed.

The subject site is zoned 'Conservation' pursuant to the City of Busselton's *Local Planning Scheme No. 21*. Both 'Single House' and 'Home Occupation' are permitted uses within this zone.

2 LEGISLATION, POLICY AND GUIDELINES

The following legislation, policy and guidelines have been considered and will guide the required and expected management outcome from Federal, State and local government agencies.

2.1 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation.

The EPBC Act aims to protect Matters of National Environmental Significance. Under the EPBC Act, the Commonwealth Department of Agriculture, Water and Environment (DAWE) lists Threatened species, Migratory species and Threatened Ecological Communities (TECs) in certain categories determined by criteria provided within the EPBC Act.

Under the EPBC Act, a significant impact is determined by the sensitivity, value and quality of the environment which is to be impacted and the intensity, duration, magnitude and geographic extent of the impacts (DEWHA 2008). If a proposed action is deemed to have a significant impact, this action should be referred to the Minister for formal assessment.

2.2 Western Australian Legislation

This desktop assessment has been undertaken in consideration of the relevant Western Australian state legislation which includes the following.

Biodiversity Conservation Act 2016 (BC Act)

The Department of Biodiversity Conservation and Attractions (DBCA) lists flora and fauna taxa under the provisions of the BC Act as protected according to their need for protection. Flora is given Declared Rare status when their populations are geographically restricted or are threatened by local processes. In addition, under the BC Act, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora and fauna is protected throughout the State.

Environmental Protection Act 1986 (EP Act)

This EP Act is administered by the Department of Water and Environmental Regulation (DWER) and DBCA. The EP Act provides for conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with it. The Act establishes head powers to provide mechanisms for the development of Environmental Protection Policies (EPP), the referral and assessment of proposals (Environmental Impact Assessment), the control of pollution and enforcement. The Act also provides for an Environmental Protection Authority (EPA) that is a statutory authority and is the primary provider of independent environmental advice to Government. The EPA is assisted by the EPA Service Unit comprising the Environmental Impact Assessment and Policy Divisions of the DWER.

3 BIOPHYSICAL ENVIRONMENT

3.1 Land Use

Historically, the subject site has been used for broad acre agriculture. The current owners utilise the property for cattle grazing. Accordingly, the subject site has been modified, consisting of predominately paddock grasses with native vegetation restricted to an ephemeral watercourse containing Chenopodiaceae sp., *Salicornia quinqueflora* and *Senecio condyles*.

The subject site is bounded to the north by Lot 13, to the east by Lot 17, to the south by Conservation zoned lots and Forrest Beach Road to the west.

The land use surrounding the subject site is predominately associated with Rural, Rural- Residential and Conservation lots.

3.2 Topography

Site survey indicates that the topography of the subject site ranges from 0.5 m AHD and 1 m AHD, generally increasing towards the road and the north east boundary. The adjacent Forrest Beach Road is typically at a level of 1.5 m AHD.

3.3 Landform and Soils

The subject site is located on the western edge of the Swan Coastal Plain, along the south-eastern shores of Geographe Bay. The Swan Coastal Plain is characterised by a generally subdued topography formed almost entirely of river (fluvial) and windblown (aeolian) depositional material and arranged in a sequence of four parallel main geomorphic units: Quindalup Dune System, Spearwood Dune System, Bassendean Dune System and Pinjarra Plain (WAPC 2005).

Regional soil mapping prepared by the Department of Agriculture and Food Western Australia (DAFWA) indicates that the subject site is located within the Vasse Land System and the Vasse-Wonnerup wet flats Phase (DAFWA 2012). This soil sub-system is characterised as poorly drained flats around the edge of the Vasse Estuary, with dark calcareous sands and mixed estuarine deposits.

3.4 Acid Sulfate Soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. ASS can pose issues when oxidised, producing sulphuric acid, which can present a range of risks for the surrounding environment, infrastructure and human health.

The Department of Water and Environment Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2019). A review of the DWER mapping indicates that the subject site is classified as having a 'high to moderate risk' of ASS occurring within 3 m of the natural soil.

3.5 Groundwater

The subject site is located within the Busselton - Capel groundwater area as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The catchment is underlain by the Superficial aquifer, which is approximately 10 m thick. Below this lies the Leederville aquifer, which in turn is underlain by the older

and larger Yarragadee aquifer. Both the Leederville and Yarragadee are confined aquifers that are recharged by direct infiltration of rainfall on the Blackwood Plateau. In thickness the Leederville aquifer varies from 50 m in the west to approximately 500 m in the east, while the Yarragadee aquifer ranges from 600 m to 1,600 m. All three of these aquifers flow towards the coast (WAWA 1995).

The DWER's Water Information Reporting Tool indicates that a Busselton shallow bore (BN9S) is located approximately 400 m north of the subject site. Records from this groundwater monitoring bore indicate that during the month of September, groundwater levels ranged from 0.15 m AHD to 0.675 m AHD from 2005 to 2019, with an average of 0.35 m AHD during this period.

3.6 Hydrology

The Malbup River is located approximately 100 m east of the subject site. This watercourse is associated with the Vasse-Wonnerup wetlands which is listed as a Wetland of International Importance under the Ramsar *Convention on Wetlands*.

Wetlands within Western Australia are classified on the basis of landform and water permanence pursuant to the Semeniuk (1995) classification system (refer to **Table 1**).

Table 1. Wetland classifications (Semeniuk 1995).

Water Longevity	Landform				
	Basin	Channel	Flat	Slope	Highland
Permanent Inundation	Lake	River	-	-	-
Seasonal Inundation	Sumpland	Creek	Floodplain	-	-
Intermittent Inundation	Playa	Wadi	Barlkarra	-	-
Seasonal Waterlogging	Dampland	Trough	Palusplain	Paluslope	Palusmont

Areas of wetlands have been mapped previously by Semenuik (1995) across the entire Swan Coastal Plain. This mapping has been converted into a digital dataset that is maintained by the DBCA and is referred to as the '*Geomorphic Wetland of the Swan Coastal Plain*' dataset. This dataset contains information on geomorphic wetland types and assigns management categories that guide the recommended management approach for each wetland area. The wetland management categories and management objectives are listed in **Table 2**.

Table 2. DBCA wetland management categories (Semeniuk 1995).

Category	Description	Management Objectives
Conservation	Wetlands support a high level of ecological attributes and functions.	Highest priority wetlands. Objective is to preserve and protect the existing conservation values of the wetlands through various mechanisms including: • Reservation in national parks, crown reserves and State owned land, • Protection under Environmental Protection Policies, and • Wetland covenanting by landowners. No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.

Category	Description	Management Objectives
Resource Enhancement	Wetlands which may have been partially modified but still support substantial ecological attributes and functions	Priority wetlands. Ultimate objective is to manage, restore and protect towards improving their conservation value. These wetlands have the potential to be restored to Conservation category. This can be achieved by restoring wetland function, structure and biodiversity.
Multiple Use	Wetlands with few remaining attributes and functions	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare.

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset indicates that the subject site is contained within an area mapped as a Multiple Use (MU) wetland (UFI 13,208).

The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and is located to the east of the subject site (refer to **Figure 2**).

Flood mapping prepared by the DWER demonstrates that the subject site is located within the flood fringe (DWER 2015) (refer to **Figure 3**).

3.7 Vegetation and Flora

3.7.1 Flora

A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020 within the subject site. A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera (Accendo 2020).

No Threatened Flora pursuant to the *Biodiversity Conservation Act 2016* (BC Act) nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey (Accendo 2020).

3.7.2 Vegetation

Mapping of vegetation complexes for the Swan Coastal Plain places the subject site within the Vasse vegetation complex, which is described as a mixture of the closed scrub of *Melaleuca* species, fringing *Eucalyptus rudis* – Melaleuca species woodlands, as well as tuart – jarrah – marri open forests. South of the Capel River, it also includes areas dominated by *Tecticornia* and *Salicornia* species (Webb *et al.* 2016). The *Swan Coastal Plain Vegetation Complex Statistics Report* (Webb *et al.* 2016) states that 4,924 ha of the complex remains, representing over 31% of its original pre-European extent with 13% protected in the reserve system.

During the flora and vegetation survey, vegetation within the subject site was described as cultivated pasture intersected by areas of the coastal saltmarsh vegetation community. The pasture grasses include **Lolium rigidum, *Avena barbata* and **Bromus diandrus.* Other exotic taxa in the pastured areas include **Solanum linnaeanum, *Ornithopus compressus, *Lotus subbiflorus* and **Romulea rosea* var. *australis* (Accendo 2020).

The coastal saltmarsh vegetation community within the subject site is dominated by *Salicornia quinqueflora*. Associated species include *Senecio condylus*, **Lolium rigidum*, a Chenopodiaceae species and another unidentifiable monocot species (Accendo 2020). The coastal saltmarsh vegetation community is in 'Excellent' condition, with only a minor presence of weeds.

The remainder of the subject site is in a 'Completely Degraded' condition as it has lost much of its original natural botanical value from its conversion to agricultural pasture (refer to **Figure 4**).

Threatened Ecological Communities

The coastal saltmarsh vegetation community within the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh' community, which is listed as a TEC under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019).

A key criterion to be considered part of the TEC is a continuous or intermittent saltwater influence. The Wonnerup surge barrier, which is located nearby and downstream of the subject site, prevents flooding of low-lying land during winter storms and restricts connection to the ocean during this period. However, fish gates are opened during summer to allow saltwater to enter the estuary to inhibit the formation of algal blooms (DWER 2018). During this period, the saltmarshes within the subject site are subject to some saltwater influences from the ocean.

3.7.3 Environmentally Sensitive Areas

Section 51B of the EP Act allows the Minister to declare an Environmentally Sensitive Area (ESA). Once declared, the exemptions to clear native vegetation under the regulations do not apply in these areas. TECs, areas within 50 m of any Declared Rare Flora and defined wetland areas constitute ESAs. However, a number of other areas of environmental significance are also listed. Current declared ESAs are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

The subject site, in addition to the wetland area spanning from Peppermint Grove to West Busselton, is located within an ESA. This mapping is attributed to proximity to the Vasse-Wonnerup wetland, a Ramsar and CC wetland.

3.8 Fauna

3.8.1 Fauna of Conservation Significance

A search of the DBCA's Threatened Fauna database was undertaken to establish whether species declared as 'Rare or likely to become extinct' (Schedule 1), 'Birds protected under an international agreement' (Schedule 3) and 'Other specially protected fauna' (Schedule 4) as listed under the *Biodiversity Conservation Act 2016* have been recorded in proximity to the subject site. The NatureMap Report identified four Threatened fauna species, two Priority 4 fauna species, eight fauna species protected under international agreement and one other specially protected fauna species as occurring within 2 km of the subject site (refer to **Table 3**).

The EPBC Act Protected Matters Search Tool (PMST) also identified several Threatened and Migratory species that could potentially occur within or in proximity to the subject site. This included three species classified as Vulnerable, two Endangered species, one Critically Endangered species and 20 Migratory bird species (refer **Table 3**).

The DBCA database search results are based on recorded occurrences of individuals and therefore are considered more accurate than the PMST results which are typically a product of modelled distributions of species.

The likelihood of each of the fauna species occurring within the subject site is shown in **Table 3** below. The Threatened/Migratory marine species have been excluded from the likelihood table as the subject site is not directly connected to the ocean.

The conservation significant fauna species considered likely to occur within the subject site are waders and waterbirds. This is on the basis that fauna habitat within the subject site is exclusively restricted to the coastal saltmarsh vegetation community TEC. It is also noted that the Vasse-Wonnerup wetland provides habitat for more than 30,000 waterbirds, being one of the most significant waterbird habitats in Western Australia.

Table 3. Significant fauna potentially occurring within the subject site as identified by State and Commonwealth database searches.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Apus pacificus subsp. *pacificus* (Fork-tailed Swift)	IA	Migratory	Unlikely. No records of the species occurring in the area.
Actitis hypoleucos (Common Sandpiper)	IA	Migratory	Likely. The species is found in a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. May utilize area associated with the coastal saltmarsh vegetation community.
Ardea ibis (Cattle Egret)	IA	Migratory	Likely. This species is widely distributed in a wide range of wetland habitats and usually frequents shallow waters. May utilize area associated with the coastal saltmarsh vegetation community.
Ardea modesta (Eastern Great Egret)	IA	Migratory	
Ardea alba (Great Egret)	IA	Migratory	
Anous tenuirostris melanops (Australian Lesser Noddy)	S1	Vulnerable	Unlikely. Lack of suitable habitat within the subject site.
Botaurus poiciloptilus (Australasian Bittern)	S1	Endangered	Unlikely. No suitable habitat (i.e. absence of tall reeds and sedges).
Calidris acuminata (Sharp-tailed Sandpiper)	IA	Migratory	Possible. The species is known to occur inland in saline environments.
Calidris canutus (Red knot)	S1	Endangered	Unlikely. No records of the species occurring in the locality.
Calidris canutus (Red-necked Stint)	IA	Migratory	Likely. Known to forage on intertidal flats in the locality.
Charadrius bicinctus (Double-banded Plover)	IA	Migratory	Unlikely. Not found within the locality.
Charadrius ruficapilluss (Red-capped Plover)	IA	Migratory	Likely. The species is known to inhabit estuarine habitats.
Falco peregrinus (Peregrine Falcon)	S	-	Possible. This species is found in a wide variety of habitats.
Haliaeetus leucogaster (White-bellied Sea Eagle)	IA	Migratory	Possible. This species is found in coastal habitats and terrestrial wetlands. They are known to occur in estuaries.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Hydroprogne caspia (Caspian Tern)	IA	Migratory	Unlikely. Not found within the locality.
Limosa lapponica (Bar-tailed Godwit)	IA	Migratory	Unlikely. Not found within the locality.
Isoodon obesulus subsp. fusciventer (Quenda)	P4	-	Unlikely. Absence of suitable habitat.
Merops ornatus (Rainbow Bee-eater)	IA	Migratory	Possible. Found in a wide variety of habitats, often near permanent water. Unlikely to rely on the subject site for habitat.
Motacilla cinereal (Grey wagtail)	IA	Migratory	Unlikely. Not found within the locality.
Numenius madagascariensis (Eastern Curlew)	S1	Critically Endangered	Unlikely. Not found within the locality.
Oxyura australis (Blue-billed Duck)	P4	-	Possible. Known to occur in fresh to saline wetlands that may be artificial. May utilize area associated with the coastal saltmarsh vegetation community.
Pandion haliaetus (Osprey)	IA	Migratory	Unlikely. Not found within the locality.
Pseudocheirus occidentalis (Western Ringtail Possum)	S1	Vulnerable	Unlikely. No suitable habitat.
Thalasseus bergii (Crested Tern)	IA	Migratory	Unlikely. Not found within the locality.
Thinornis rubricollis (Hooded Plover)	P4	Migratory	Possible. Known to occur inland from the edges of lakes, on nearby grassy freshwater seepages, and in estuaries.
Tringa glareola (Wood Sandpiper)	IA	Migratory	Likely. The species is typically found in well vegetated, freshwater wetlands dominated by tall fringing vegetation. It is rarely found in brackish wetlands. It is known to use artificial wetlands. Known to occur in the Vasse-Wonnerup estuary.
Tringa nebularia (Common Greenshank, greenshank)	IA	Migratory	Likely. The species is found in a wide variety of inland waters and sheltered coastal habitat of varying salinity. It is known to use artificial wetlands. May utilize area associated with the coastal saltmarsh vegetation community.
Tringa stagnatilis (Marsh Sandpiper)	IA	Migratory	Unlikely. Not found within the locality.

Of the abovementioned species, eight migratory bird species are considered likely to occur within or adjacent (Vasse-Wonnerup wetlands) to the subject site. No threatened fauna species are considered likely to inhabit the subject site.

Habitat for migratory bird species within the subject site is restricted to the coastal saltmarsh vegetation community TEC. The pasture areas within the subject site do not provide habitat for wetland fauna.

Accordingly, waterbirds within the subject site may only occur as vagrants given the substantial area of coastal vegetation available in proximity to the subject site.

3.9 Aboriginal Heritage

All Aboriginal sites in Western Australia are provided protection under the *Aboriginal Heritage Act 1972* in which it is an offence for anyone to excavate, damage, destroy, conceal or in any way alter an Aboriginal site without the Minister's permission.

An online search for relevant Aboriginal heritage information was undertaken using the Department of Planning, Lands and Heritage (DPLH) Aboriginal Inquiry System that incorporates both the heritage site register and the heritage survey database (DPLH 2020). The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* and contains information on over 22,000 listed Aboriginal sites throughout Western Australia.

Results from the database search indicate that the subject site is mapped within the Other Heritage Place 4566 (Cable Sands Skull) (refer to **Figure 5**). Accordingly, it may be necessary to further liaise with the DPLH to determine the status and restrictions associated with the registered site.

Based on extent of disturbance (i.e. no ground disturbing works), it is not anticipated that this heritage listing represents a significant constraint to the proposed development.

4 POTENTIAL IMPACTS AND MANAGEMENT

During the process of undertaking this investigation, a range of specific environmental issues were explored in relation to the subject site and the proposed development. These issues arise from the proposed development, the existing environment of the subject site, its surrounds and the prevailing state and federal environment policy and legislation. The implications associated with the issues in the context of the intended development of the subject site are discussed in this Section.

4.1 Acid Sulfate Soils

The subject site is classified as having a high to moderate risk of ASS occurring within 3 m of the natural soil surface (DWER 2020). In an undisturbed state below the water table, these soils remain benign and non-acidic. However, if these soils are exposed to the atmosphere through drainage, excavation or dewatering, the sulfides may react with oxygen and form sulfuric acid.

4.1.1 Management Measures

The principal management objective for ASS within the subject site is to ensure that any future development that may disturb ASS is appropriately managed to avoid impacts on the environment.

The proposed building envelope is located outside of the mapped floodway, and within the flood fringe. Accordingly, clean fill will be imported to create a sand pad at a finished floor level of 3.0 m AHD for both the house and the effluent disposal area. This will provide significant clearance from the natural ground level denoting that excavation works below the natural ground level are not anticipated.

There will be no connections to underground services (i.e. power, reticulated water), with above-ground power provided to the dwelling. Furthermore, the proposed installation of culverts associated with the driveway will be undertaken in a manner whereby excavations will be limited or not required, to reduce impacts to remnant native vegetation.

On this basis, there are not expected to be any disturbances to potential ASS material.

4.2 Wetlands

The EPA's objective for inland waters is '*to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*' (EPA 2018).

The subject site is bordered to the north by a Conservation Category and Ramsar wetland, namely the Vasse-Wonnerup wetland.

4.2.1 Management Measures

The buffer adjoining a wetland helps to maintain the ecological processes and functions associated with the wetland, and aims to protect the wetland from potential adverse impacts. A buffer can also help to protect the community from potential nuisance insects. To maintain wetland values, it is important to determine, protect and manage an adequate buffer.

DBCA recommends a minimum 50 m buffer distance for Conservation Category wetlands that are to be protected (DPaW 2015). The 50 m buffer distance is considered to be generic and can be amended based on the values of the wetlands to be protected.

In consideration of the conservation significance of the Vasse-Wonnerup wetland and onsite constraints, site specific buffers have been formulated.

Accordingly, the proposed effluent disposal area and building envelope will be setback 80 m from the mapped boundary of the Conservation Category wetland, and 108 m from the mapped Ramsar wetland.

The subject site is contained within a mapped MU wetland. MU wetlands are assessed as possessing few remaining ecological attributes and functions. While such wetlands can still contribute to regional or landscape ecosystem management, including hydrological function, they are considered to have low intrinsic ecological value. Typically, they have minimal or no native vegetation remaining (less than 10%). Accordingly, there is no legislative requirement to protect or retain them and as such MU wetlands do not usually preclude development.

The management objective for MU wetlands is to preserve the hydrological functions in the context of the proposed development (EPA 2008). The proposed building envelope and driveway has been strategically located and designed to maintain existing hydrological functions, thereby complying with the management objectives associated with MU wetlands. Specifically, this includes the installation of suitably sized culverts for the proposed driveway where it traverses an ephemeral waterway, to minimise the impacts on the natural hydrology of the area. The hydrological regime will be maintained with the construction of culverts that will allow surface water to move across the landscape in patterns equal to current regimes. The design and installation of the culverts will ensure the surface water flows are maintained, including the hydraulic connectivity between areas of wetlands intersected/fragmented by the driveway.

The current water cycle on the subject site consists of inputs from rainwater being infiltrated on site. The development is not proposing to significantly alter this process, except for the importation of potable water to top up rainwater tanks, as required. The proposed development consists of a closed cycle, with rainwater water being captured on site and reinfiltrated via the proposed effluent disposal site.

In consideration of the above measures, there are not anticipated to be any direct impacts to wetlands of conservation significance as a result of the proposed development.

4.3 Wastewater Management

Effluent or domestic wastewater is derived from bathrooms, kitchens, laundries and toilets. It contains human waste (containing pathogens), paper, soap, detergent residues and food scraps (DoW 2010). The *Government Sewerage Policy* (DPLH 2019) provides a best practice approach for the provision of onsite sewage treatment and disposal.

It is understood that the subject site is not located on a reticulated water or wastewater supply network. Accordingly, onsite wastewater management will be required for the proposed building envelope.

The subject site is located within a sewage sensitive area (specifically within the estuary catchments on the Swan and Scott Coastal Plains) (DPLH 2019). In addition, the subject site is located within the specified area prescribed in the '*Vasse Wonnerup Wetlands and Geographe Bay Water Quality Improvement Plan, 2010*' (WQIP), specifically in the Sabina River catchment.

Pursuant to the WQIP, the Sabina River has been classified as a 'recovery' catchment, whereby waterways currently do not meet the water quality criteria of 0.1 mg/L for total phosphorus and 1.0 mg/L for total nitrogen. The management objectives for this catchment are to decrease median winter nitrogen and phosphorus concentrations to 1.0 mg/L and 0.1 mg/L, respectively. These water quality management objectives will require consideration when determining onsite effluent treatment and disposal requirements.

A *Site and Soil Evaluation* (WML 2020) was undertaken for the subject site to determine the capacity of the site for onsite effluent disposal in consideration of the *Government Sewerage Policy* (DPLH 2019). Several

options were considered for both the treatment system and land application area (LAA). Based on a site-specific investigation, it was recommended to treat the sewage wastewater to a secondary level using an Aerobic Treatment Unit (ATU) with nutrient removal by a suitable Department of Health (DOH)-approved treatment system. The treated wastewater shall then be applied to an elevated LAA via sub-surface drip irrigation (WML 2020).

In summary, the *Site and Soil Evaluation* (WML 2020) deemed onsite effluent disposal suitable pursuant to the *Government Sewerage Policy* (DPLH 2019) based on the following:

- Secondary treatment with nutrient removal of the sewage wastewater with an Aerobic Treatment Unit is required.
- A minimum LAA of 150 m^2 is required.
- The land application system should be comprised of sub- surface drip irrigation.
- Clay loam fill shall be imported for the LAA to provide a suitable soil for nutrient removal.
- The LAA should be bunded and sloped away from the wetland to prevent contamination from stormwater runoff.
- There are ongoing landowner obligations to ensure that operation and management of the treatment and disposal system is regularly maintained in accordance with relevant health regulations and manufacturer's recommendations.

4.3.1 Management Measures

Design specifications of the proposed secondary treatment system, including the location and discharge mechanisms (i.e. land application areas or discharge outlets) should be undertaken in accordance with the recommendations provided in the *Site and Soil Evaluation* (WML 2020). This assessment considers the specific site constraints present within the subject site including the estimated hydraulic and nutrient load, soil texture and category, and clearances to groundwater. Future Lot owners will be informed of these requirements prior to the purchase of the subject site and as part of development approval will need to apply to construct or install a wastewater treatment system.

4.4 Vegetation and Flora

The EPA objective for flora and vegetation is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*' (EPA 2016). Where a proposal may potentially impact upon flora and vegetation values, the following mitigation hierarchy should be applied to minimise potential impacts:

1. Avoid impacts.

2. Minimise impacts.

3. Offset impacts.

Construction of the proposed driveway will result in the removal of approximately 250 m^2 of native vegetation. This vegetation is comprised of the coastal saltmarsh vegetation community TEC/PEC. It is noted that the subject site contains a total of 1.1 ha of the coastal saltmarsh vegetation community TEC.

The Threatened Species Scientific Committee (TSSC) provides information on the estimated extent of the coastal saltmarsh vegetation community TEC within Western Australia. An assessment of the significance of the proposed clearing of the TEC within local and regional scales was made by comparing the extent within the clearing footprint to that published for the community (TSSC 2013).

The total extent of the coastal saltmarsh vegetation community TEC within Western Australia is estimated to be approximately 4,000 ha (TSSC 2013). The Swan Coastal Plain bio-geographic region contains the

largest areas of saltmarsh vegetation in Western Australia. On a local scale, the Broadwater and Vasse-Wonnerup wetland system, comprised of 900 ha of core wetlands (excluding floodplains), has been mapped by Tingay and Tingay (1980) as containing saltmarsh vegetation associated with the TEC.

Based on the above, the clearing of 250 m^2 of the coastal saltmarsh vegetation community TEC would result in a reduction of up to 0.0006% of the total estimated extent and less than 0.003% at a local scale. Within the subject site, this would equate to the removal of approximately 2% of the total extent of the coastal saltmarsh vegetation community TEC.

In consideration of the extent of the coastal saltmarsh vegetation community TEC at these scales and the area of clearing required for the proposed development, the impact of the clearing on this community is not considered to be significant.

Potential indirect impacts to native vegetation (particularly the coastal saltmarsh vegetation community TEC) are restricted to the increased risk of spread or introduction of weeds during construction works.

Indirect impact to the coastal saltmarsh vegetation community TEC from changes in hydrology are not expected, and accordingly, has not been listed above. Altering existing flow paths has the potential to negatively impact the hydrological regime (most notably drying) of the TEC occurrences. As discussed in **Section 4.2**, existing drainage patterns to adjacent TEC vegetation will be maintained. Impacts from changes to flow paths and or changes in hydrology are therefore not expected to result from the proposed development.

4.4.1 Management Measures

The configuration of the building envelope has been informed by the onsite flora and vegetation survey (Accendo 2020) to protect areas of increased environmental values, namely the coastal saltmarsh vegetation community TEC.

It is noted that within the DWER document *A guide to the assessment of applications to clear native vegetation* (2014), in reference to TECs it is stated that buffers should be determined on a case-by-case basis and in relation to the characteristics of the ecological communities being protected, and the surrounding land uses.

To avoid any direct impacts to the TEC whilst providing the greatest possible separation distance to the CC and Ramsar wetland, a 33 m setback will be provided from the land application area (associated with the onsite effluent disposal system) and the mapped TEC within the subject site.

Potential indirect impacts identified above can be appropriately managed in accordance with standard operational controls which will be documented within a Construction Environmental Management Plan (CEMP). The implementation of standard operational controls can be expected to appropriately control the risk of the introduction or spread of introduced flora taxa and as a minimum will include the following management measures:

- Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
- Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and
- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands.

The occurrence of the coastal saltmarsh vegetation community TEC remaining after the implementation of the proposed development will still meet the criteria for the TEC / PEC as per State and Commonwealth policies. The viability of this occurrences is considered unlikely to change as a result of the proposed development.

4.5 Fauna

This subject site is adjacent to the Vasse-Wonnerup wetlands which is of international importance for bird conservation for resident waterbirds and migratory shorebirds. In addition, the subject site contains an area of the coastal saltmarsh vegetation community which is recognised as an important feeding, roosting and refuge habitat for resident and migratory waterbirds.

The EPA's objective for terrestrial fauna is '*to protect fauna so that biological diversity and ecological integrity are maintained*' (EPA 2016). The application of the mitigation hierarchy has been applied to avoid or minimise impacts to terrestrial fauna where possible.

To access the building envelope, it is necessary for the driveway to traverse a small area of the coastal saltmarsh vegetation community which is known to provide habitat to waterbirds. The clearing of 250 m^2 of waterbird habitat is not expected to be significant given that 1 ha will be retained onsite and the adjoining Vasse-Wonnerup wetland system provides 900 ha of core wetland habitat.

Furthermore, to minimise indirect impacts, a 108 m setback from the proposed onsite effluent disposal area to the Ramsar wetland has been provided.

The proposed development may result in indirect impacts to fauna including:

- Incremental loss of fauna habitat (fragmentation, barrier effects and edge effects).
- Displacement of native fauna species due to increased noise.
- Displacement of native fauna species due to light spill.

4.5.1 Management Measures

In the context of the proposed single dwelling development within the subject site, the environmental aspects detailed in **Table 4** have been assessed in consideration of potential impacts to waterbirds.

Table 4. Potential impacts associated with waterbirds.

Impacts	Assessment	Outcome
Weed/disease spread	The spread or introduction of weeds is a risk associated with the construction of the driveway and building envelope. Changes to the floristic and structural nature of vegetation can reduce the habitat value. Within the subject site, it is noted that livestock grazing which is the current land use, has occurred over the past 100 years and has resulted in the vegetation not mapped as a TEC being in a 'completely degraded' condition. In consideration of the proposed setbacks and existing condition of the subject site, the addition of one new residential dwelling is unlikely to pose a significant risk	Potential risks associated with weed/disease spread will be further minimised by the development and implementation of weed hygiene measures prior to and during construction. This will include the following: - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite; - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate

Impacts	Assessment	Outcome
	to fauna in association with the spread/introduction of weeds.	waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and - Weed free fill is to be used for on-site earthworks. Weed/disease spread is expected to pose negligible risk to fauna.
Loss of habitat	Construction of the driveway will result in the loss of approximately 250 m^2 of potential habitat. This equates to a reduction of up to 0.0006% of the total estimated extent of the TEC in Western Australia, and less than 0.003% of the TEC at a local scale. Within the subject site, this would equate to the removal of approximately 2% of the total extent of the coastal saltmarsh vegetation community TEC. The impact of the clearing to potential waterbird habitat is not considered to be significant given the extent of potential habitat at a local scale and the potential area of clearing required for the driveway.	Given the availability of habitat at a local scale for wetland species, the loss of 250 m^2 of potential habitat is unlikely to have a significant impact on any wetland dependent species.
Alteration to water quality	The construction of the driveway will involve works including the clearing of native vegetation, construction earthworks and drainage construction. Each of these may have the potential to result in an increase in water turbidity (suspended sediments) and / or sedimentation within the watercourse located in the subject site. To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May).	Alteration to water quality is not expected to result in a significant impact to fauna from the proposed development, provided the driveway is constructed when the watercourse is dry.
Alteration of hydrological regimes	As discussed in **Section 4.2**, drainage design associated with the culverts for the driveway has sought to maintain the existing surface water hydrology, both within the subject site and surrounds. The sizing and design of surface water drainage structures for the driveway will be sufficient to maintain the existing	Alteration of hydrological regimes is not expected to result in a significant impact to fauna from the proposed development.

Impacts	Assessment	Outcome
	hydrological flows through the watercourse.	
Light spill	Artificial lighting from the residential dwelling may cause disturbance to some terrestrial fauna. Potential impacts are the alteration of foraging activity to bats, and changes in fauna assemblage in any areas affected by light spill. Lighting may also increase the availability of prey for adaptable bats and birds by attracting insects. Light spill from a single residential dwelling within the lot will be minimal. Furthermore, the residential dwelling will be setback 100m from the Ramsar wetland, denoting that light spill is very unlikely to impact fauna habitat areas within this wetland. It is noted that light spill may impact the areas containing the TEC adjacent to the building envelope. Any displacement impact from the proposed development would be limited to a small number of individuals. Further, such individuals are likely to move to other parts of their existing home ranges away from the building envelope location. Any displacement impact would therefore not be expected to result in indirect mortality of individuals, or displacement of waterbird individuals from their habitat entirely.	Light spill is not expected to result in a significant impact to fauna from the proposed development.
Introduction of non-endemic fauna	The introduction/increase in non-endemic fauna may lead to increased predation of waterbirds. One residential dwelling within the subject site is unlikely to significantly increase populations of non-endemic fauna.	The introduction/increase in non-endemic fauna is not expected to result in a significant impact to fauna from the proposed development.
Noise	Noise generated by machinery during construction has the potential to affect fauna. Construction noise may lead to avoidance of the area by fauna. It is known that some form of habituation occurs in response to repeated noise, whereby fauna simply maintain activities in their natural	Noise is not expected to result in a significant impact to fauna from the proposed development.

Impacts	Assessment	Outcome
	habitat after an initial period of acclimatisation. Given the short-term and localised nature of construction noise, it is anticipated that the impacts of noise on fauna will be negligible. Furthermore, the addition of one new residential dwelling, with considerable setbacks to the conservation significant wetlands will produce limited impacts to waterbirds. It is noted that noise may impact the areas containing the TEC adjacent to the building envelope. Any displacement impact from the proposed development would be limited to a small number of individuals. Further, such individuals are likely to move to other parts of their existing home ranges away from the building envelope location. Any displacement impact would therefore not be expected to result in indirect mortality of individuals, or displacement of waterbird individuals from their habitat entirely.	

The Vasse-Wonnerup Ramsar site comprises an area of 1,115 ha of waterbird habitat in secure conservation areas. The effect of the proposed development will be minimal at the broader scale represented by this reserve area. Therefore, the proposed development in itself is very unlikely to contribute significantly to a long-term reduction in the size of the populations of any of waterbird species of conservation significance.

5 CONCLUSION

The key environmental aspects associated with the subject site in the context of the proposed development include:

- ASS;
- Wetlands;
- Wastewater;
- Vegetation and flora; and
- Fauna.

The design of the proposed development has responded to site-specific environmental constraints as far as practicable. This has been achieved with the following avoidance and management measures:

- Avoidance Measures:
    - Provision of a 108 m setback from the effluent disposal area to the Ramsar wetland.
    - Provision of a 83 m setback from the building envelope to the CC wetland.
    - Minor direct impact to the coastal saltmarsh vegetation community TEC.
- Management Measures:
    - Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
    - To effectively manage water quality impacts, construction works associated with the driveway will be restricted to months when the watercourse is dry (i.e. January to May);
    - Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free;
    - Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands;
    - Implement weed and disease management measures including;
        - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite;
        - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and
        - Weed free fill is to be used for on-site earthworks.

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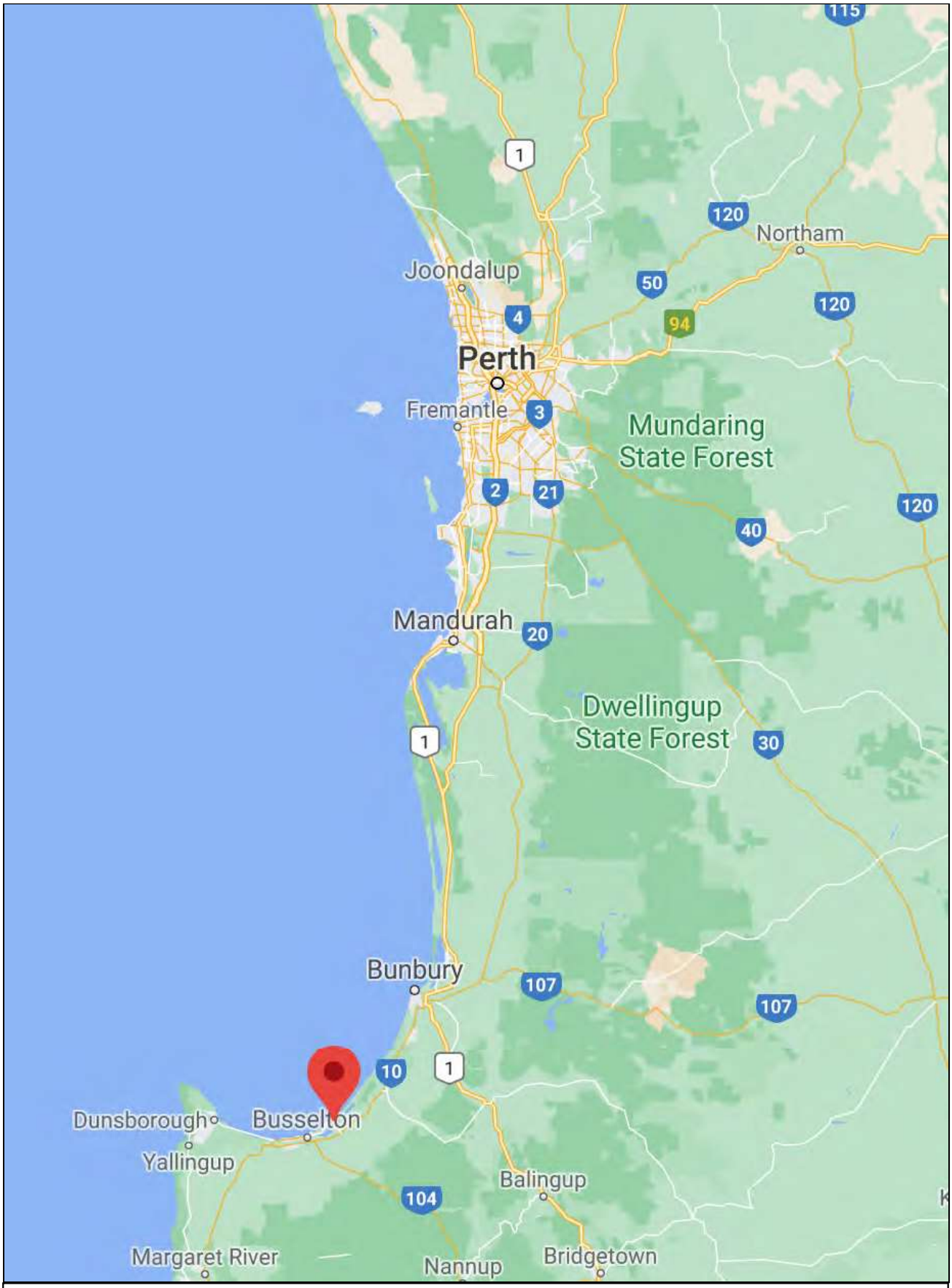
FIGURES



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DRAWING TITLE	Figure 1 – Site Locality	Designed PN	Checked	
		Drawn PN	Approved	
CLIENT	Wonnerup Group Pty Ltd	Date	16/09/2020	
		Local Authority	City of Busselton	
		Sheet 1 of 1		

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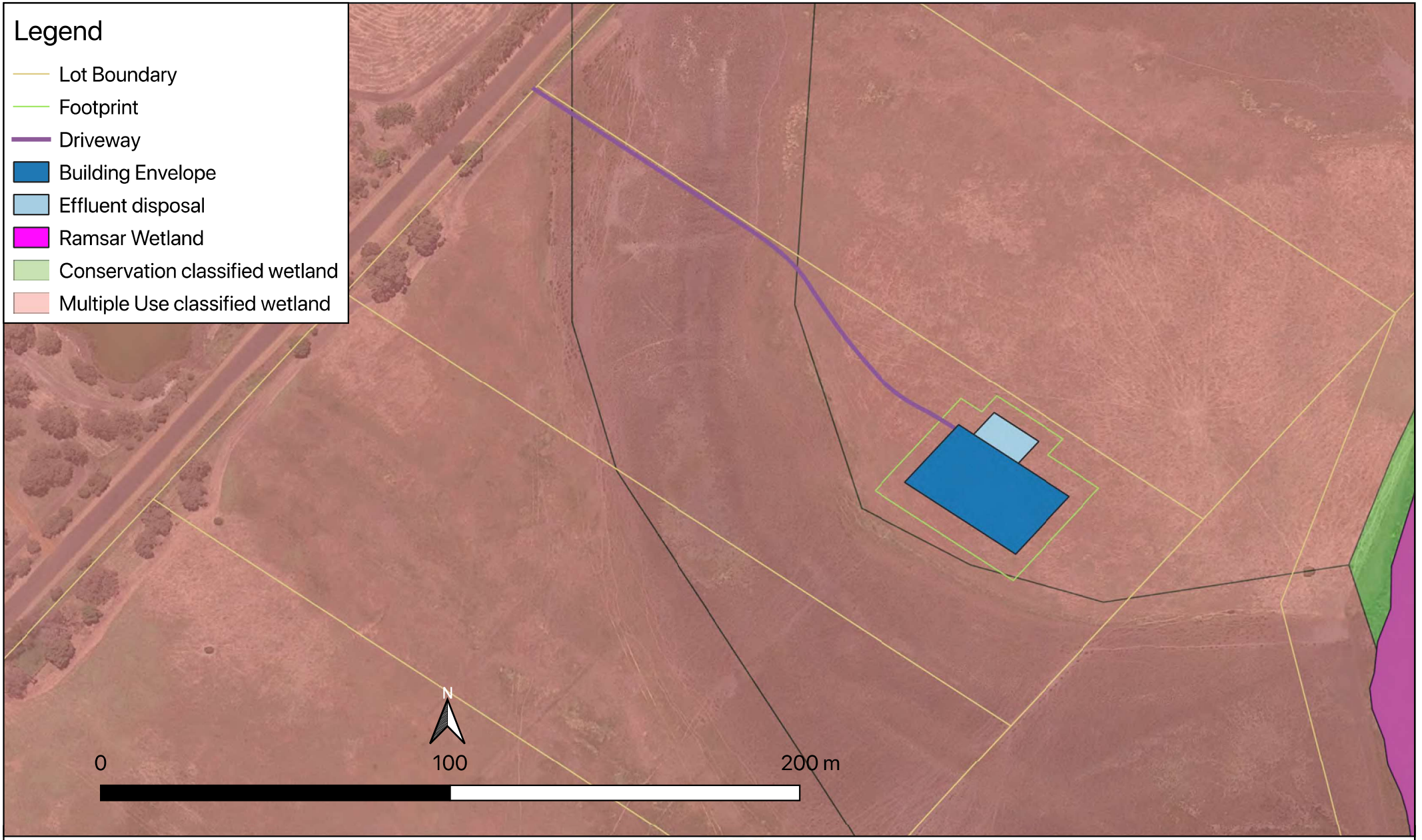

PROJECT	Lot 14 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 2 Wetland Mapping
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

PROJECT	Lot 14 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 3 Floodplain Mapping
CLIENT	Wonnerup Group Pty Ltd

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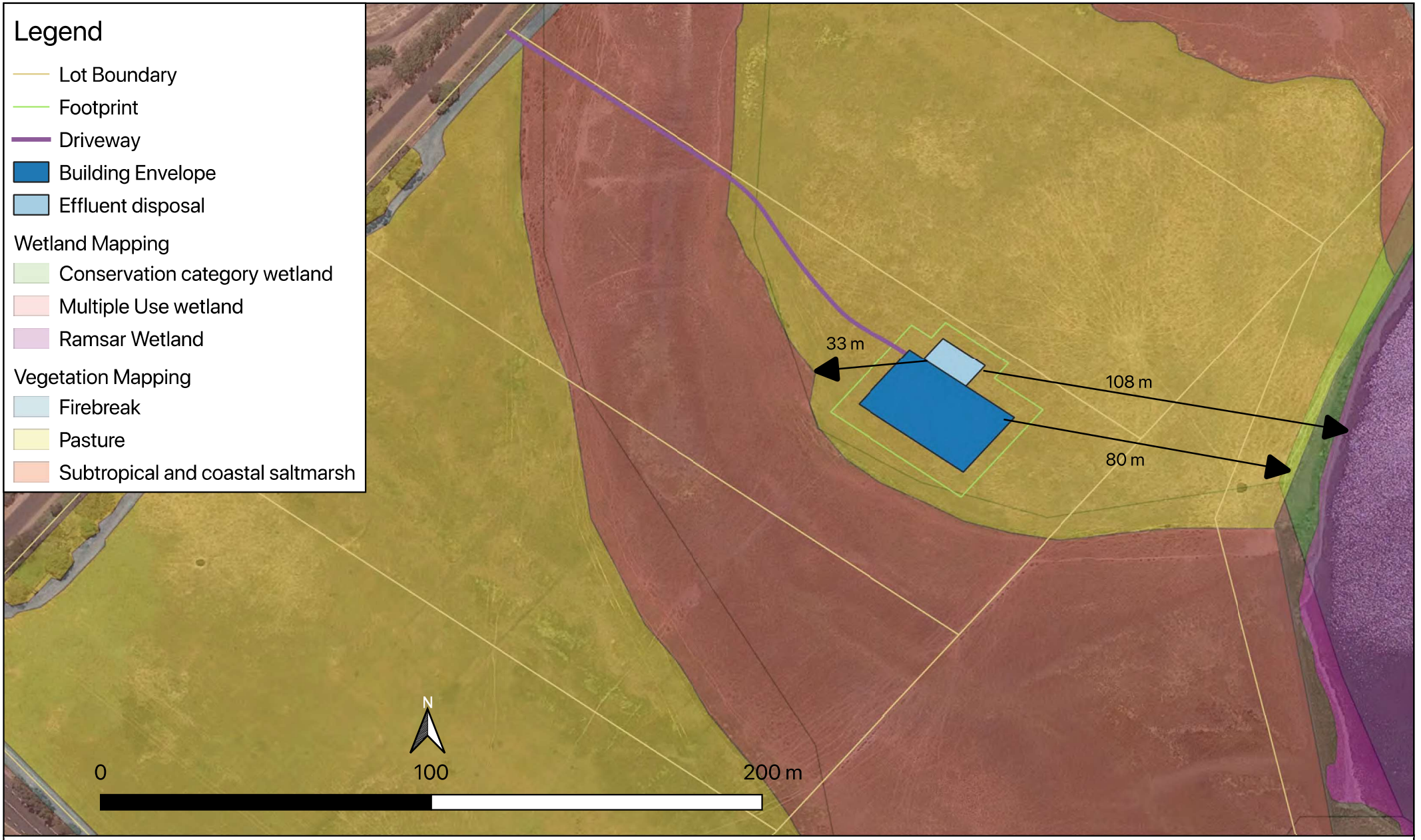
Project Number	2041	Designed	PN
Drawing Number	Figure 3	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton



PROJECT Lot 14 Forrest Beach Road, Wonnerup

DRAWING TITLE Figure 4 Vegetation Mapping & Setback Distances

CLIENT Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
Drawing Number	Figure 4	Drawn	PN
Revision	A	Checked	
Date	8/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

Legend

- Lot Boundary
- Driveway
- Footprint
- Building Envelope
- Effluent disposal
- Aboriginal heritage place

PROJECT	Lot 14 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 5 Aboriginal Heritage Mapping
CLIENT	Wonnerup Group Pty Ltd

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Project Number	2041	Designed	PN
Drawing Number	Figure 5	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

APPENDIX D – DESKTOP ENVIRONMENTAL IMPACT ASSESSMENT – LOT 15 FORREST BEACH ROAD

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STATEMENT OF ENVIRONMENTAL EFFECTS REPORT

LOT 15 FORREST BEACH ROAD, WONNERUP

NOVEMBER 2020

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Limitations

This report has been prepared by Accendo Australia Pty Ltd in accordance with the scope limitations provided in this report, or as otherwise agreed, between the Client and Accendo.

This report is strictly limited to the matters stated in it and is not to be read as extending, to any other matter in connection with the matters addressed in it.

This report has been prepared based upon data and other information provided by the Client and other individuals and organisations, most of which are referred to in the report, which Accendo has not independently verified or checked beyond the agreed scope of work. Accendo does not accept liability in connection with such unverified information.

The conclusions and recommendations in this report are based on assumptions made by Accendo described in this report where and as they are required. Accendo disclaims liability arising from any of the assumptions being incorrect.

The report is based on site specific conditions encountered and information received at the time of preparation of this report or the time that site investigations were undertaken. Accendo disclaims responsibility for any changes that may have occurred after this time.

The preparation of this report has been undertaken and performed in a professional manner, in consideration of the scope of services and in accordance with environmental consulting practices. No other warranty is made.

EXECUTIVE SUMMARY

The proponent (Wonnerup Group Pty Ltd) is seeking to develop a building envelope and associated infrastructure on Lot 15 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 2.16 ha in size and is located in the municipality of the City of Busselton.

The purpose of this Statement of Environmental Effects Report is to demonstrate that all environmental values are understood, and potential impacts associated with the future land use can be managed in accordance with legislative and policy requirements.

The proposed works entail the construction of a building envelope for a single residential dwelling within the subject site. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling.

The relevant environmental attributes and values of the subject site are summarised as follows:

- The entirety of the subject site has been historically cleared or modified to allow for agricultural activities, primarily grazing.
- The subject site is classified as having a 'high to moderate risk' of acid sulfate soils occurring within 3 m of the natural soil.
- The *Geomorphic Wetlands of the Swan Coastal Plai*n dataset indicates that the subject site is contained within an area mapped as a Multiple Use (MU) wetland (UFI 13,208). The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and is located to the east of the subject site.
- No threatened or priority flora species or vegetation communities have been identified within the subject site, nor are any likely to occur based on the degraded nature of vegetation (Accendo 2020).
- The coastal saltmarsh vegetation community within the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh', which is listed as a threatened ecological community (TEC) under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019).
- The subject site contains habitat for migratory and other waterbird species.
- One registered Aboriginal heritage site is located within the northern extent of the subject site.

The proposed development recognises the importance of the key environmental and landscape attributes of the locality. Consequently, none of the identified key environmental features present as being a constraint to the proposed development. This has been achieved with the following avoidance and management measures:

- Avoidance Measures:
    - Provision of a 301 m setback from the effluent disposal area to the Ramsar and CC wetland;
    - Provision of a 75 m setback from the effluent disposal area to the coastal saltmarsh vegetation community;
    - Limiting direct impacts to an area of approximately 2,010 m^2 of Degraded vegetation with minimal environmental values.
- Management Measures:
    - Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;

- Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free;
- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands;
- Implement weed and disease management measures including;
    - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite;
    - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and
    - Weed free fill is to be used for on-site earthworks.

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1 INTRODUCTION

1.1 Background

The proponent (Wonnerup Group Pty Ltd) is seeking to develop a building envelope and associated infrastructure on Lot 15 Forrest Beach Road, Wonnerup (herein referred to as the subject site). The subject site is 2.16 hectares (ha) in size and is located in the municipality of the City of Busselton. It is situated approximately 8 kilometres (km) north of the Busselton Central Business District (refer to **Figure 1**).

1.2 Scope and Purpose

The purpose of this Statement of Environmental Effects Report is to demonstrate that all environmental values are understood and potential impacts associated with the future land use can be managed in accordance with legislative and policy requirements, and have been adequately considered in the design of the development.

Specifically, this Report has been developed with the intent of satisfying the requirements specified in Schedule 6 of the City of Busselton's *Local Planning Scheme No. 21*.

1.3 Proposed Development

The proposed works entail the construction of a building envelope for a single residential dwelling within the subject site. Construction works will be limited to the establishment of a driveway and a sand pad for the proposed dwelling. The sand pad will be constructed to a height of 3.0 m Australian Height Datum (AHD), with this area comprising 1,000 m^2 (25 m x 40 m). With the addition of batters, the total footprint of the sand pad will be 2,000 m^2 (40 m x 50 m). An onsite effluent disposal area of 150 m^2 has been included within the 1,000 m^2 footprint.

No further subdivision or rezoning of the existing lot is proposed.

The subject site is zoned 'Conservation' pursuant to the City of Busselton's *Local Planning Scheme No. 21*. Both 'Single House' and 'Home Occupation' are permitted uses within this zone.

2 LEGISLATION, POLICY AND GUIDELINES

The following legislation, policy and guidelines have been considered and will guide the required and expected management outcome from Federal, State and local government agencies.

2.1 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation.

The EPBC Act aims to protect Matters of National Environmental Significance. Under the EPBC Act, the Commonwealth Department of Agriculture, Water and Environment (DAWE) lists Threatened species, Migratory species and Threatened Ecological Communities (TECs) in certain categories determined by criteria provided within the EPBC Act.

Under the EPBC Act, a significant impact is determined by the sensitivity, value and quality of the environment which is to be impacted and the intensity, duration, magnitude and geographic extent of the impacts (DEWHA 2008). If a proposed action is deemed to have a significant impact, this action should be referred to the Minister for formal assessment.

2.2 Western Australian Legislation

This desktop assessment has been undertaken in consideration of the relevant Western Australian state legislation which includes the following.

Biodiversity Conservation Act 2016 (BC Act)

The Department of Biodiversity Conservation and Attractions (DBCA) lists flora and fauna taxa under the provisions of the BC Act as protected according to their need for protection. Flora is given Declared Rare status when their populations are geographically restricted or are threatened by local processes. In addition, under the BC Act, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora and fauna is protected throughout the State.

Environmental Protection Act 1986 (EP Act)

This EP Act is administered by the Department of Water and Environmental Regulation (DWER) and DBCA. The EP Act provides for conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with it. The Act establishes head powers to provide mechanisms for the development of Environmental Protection Policies (EPP), the referral and assessment of proposals (Environmental Impact Assessment), the control of pollution and enforcement. The Act also provides for an Environmental Protection Authority (EPA) that is a statutory authority and is the primary provider of independent environmental advice to Government. The EPA is assisted by the EPA Service Unit comprising the Environmental Impact Assessment and Policy Divisions of the DWER.

3 BIOPHYSICAL ENVIRONMENT

3.1 Land Use

Historically, the subject site has been used for broad acre agriculture. The current owners utilise the property for cattle grazing. Accordingly, the majority of the subject site has been modified, consisting of predominately paddock grasses with native vegetation restricted to an ephemeral watercourse containing Chenopodiaceae sp., *Salicornia quinqueflora* and *Senecio condyles*.

The subject site is bounded to the north and south by Conservation zoned lots, Forrest Beach Road to the west and Rural land to east.

The land use surrounding the subject site is predominately associated with Rural, Rural- Residential and Conservation lots.

3.2 Topography

Site survey indicates that the topography of the subject site ranges from 0.5 m AHD and 1 m AHD, generally increasing towards the road and the north east boundary. The adjacent Forrest Beach Road is typically at a level of 1.5 m AHD.

3.3 Landform and Soils

The subject site is located on the western edge of the Swan Coastal Plain, along the south-eastern shores of Geographe Bay. The Swan Coastal Plain is characterised by a generally subdued topography formed almost entirely of river (fluvial) and windblown (aeolian) depositional material and arranged in a sequence of four parallel main geomorphic units: Quindalup Dune System, Spearwood Dune System, Bassendean Dune System and Pinjarra Plain (WAPC 2005).

Regional soil mapping prepared by the Department of Agriculture and Food Western Australia (DAFWA) indicates that the subject site is located within the Vasse Land System and the Vasse-Wonnerup wet flats Phase (DAFWA 2012). This soil sub-system is characterised as poorly drained flats around the edge of the Vasse Estuary, with dark calcareous sands and mixed estuarine deposits.

3.4 Acid Sulfate Soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. ASS can pose issues when oxidised, producing sulphuric acid, which can present a range of risks for the surrounding environment, infrastructure and human health.

The Department of Water and Environment Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2019). A review of the DWER mapping indicates that the subject site is classified as having a 'high to moderate risk' of ASS occurring within 3 m of the natural soil.

3.5 Groundwater

The subject site is located within the Busselton - Capel groundwater area as proclaimed under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The catchment is underlain by the Superficial aquifer, which is approximately 10 m thick. Below this lies the Leederville aquifer, which in turn is underlain by the older

and larger Yarragadee aquifer. Both the Leederville and Yarragadee are confined aquifers that are recharged by direct infiltration of rainfall on the Blackwood Plateau. In thickness the Leederville aquifer varies from 50 m in the west to approximately 500 m in the east, while the Yarragadee aquifer ranges from 600 m to 1,600 m. All three of these aquifers flow towards the coast (WAWA 1995).

The DWER's Water Information Reporting Tool indicates that a Busselton shallow bore (BN9S) is located approximately 600 m north of the subject site. Records from this groundwater monitoring bore indicate that during the month of September, groundwater levels ranged from 0.15 m AHD to 0.675m AHD from 2005 to 2019, with an average of 0.35 m AHD during this period.

3.6 Hydrology

The Malbup River is located approximately 300 m east of the building envelope. This watercourse is associated with the Vasse-Wonnerup wetlands which is listed as a Wetland of International Importance under the Ramsar *Convention on Wetlands*.

Wetlands within Western Australia are classified on the basis of landform and water permanence pursuant to the Semeniuk (1995) classification system (refer to **Table 1**).

Table 1. Wetland classifications (Semeniuk 1995).

Water Longevity	Landform				
	Basin	Channel	Flat	Slope	Highland
Permanent Inundation	Lake	River	-	-	-
Seasonal Inundation	Sumpland	Creek	Floodplain	-	-
Intermittent Inundation	Playa	Wadi	Barlkarra	-	-
Seasonal Waterlogging	Dampland	Trough	Palusplain	Paluslope	Palusmont

Areas of wetlands have been mapped previously by Semenuik (1995) across the entire Swan Coastal Plain. This mapping has been converted into a digital dataset that is maintained by the DBCA and is referred to as the '*Geomorphic Wetland of the Swan Coastal Plain*' dataset. This dataset contains information on geomorphic wetland types and assigns management categories that guide the recommended management approach for each wetland area. The wetland management categories and management objectives are listed in **Table 2**.

Table 2. DBCA wetland management categories (Semeniuk 1995).

Category	Description	Management Objectives
Conservation	Wetlands support a high level of ecological attributes and functions.	Highest priority wetlands. Objective is to preserve and protect the existing conservation values of the wetlands through various mechanisms including: • Reservation in national parks, crown reserves and State owned land, • Protection under Environmental Protection Policies, and • Wetland covenanting by landowners. No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.

Category	Description	Management Objectives
Resource Enhancement	Wetlands which may have been partially modified but still support substantial ecological attributes and functions	Priority wetlands. Ultimate objective is to manage, restore and protect towards improving their conservation value. These wetlands have the potential to be restored to Conservation category. This can be achieved by restoring wetland function, structure and biodiversity.
Multiple Use	Wetlands with few remaining attributes and functions	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare.

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset indicates that the subject site is contained within an area mapped as a Multiple Use (MU) wetland (UFI 13,208).

The Vasse-Wonnerup wetland is mapped as a Conservation Category (CC) wetland (UFI 15,214) and is located to the north-east of the subject site (refer to **Figure 2**).

Flood mapping prepared by the DWER demonstrates that the subject site is located within the flood fringe (DWER 2015) (refer to **Figure 3**).

3.7 Vegetation and Flora

3.7.1 Flora

A detailed flora and vegetation survey was conducted by a senior botanist on the 4th September 2020 within the subject site. A total of five (5) native and 25 exotic (introduced and cultivated) taxa were recorded within the site, representing 29 genera (Accendo 2020).

No Threatened Flora pursuant to the *Biodiversity Conservation Act 2016* (BC Act) nor the EPBC Act were recorded during the survey. Furthermore, no Priority Flora pursuant to state legislation were recorded during the survey (Accendo 2020).

3.7.2 Vegetation

Mapping of vegetation complexes for the Swan Coastal Plain places the subject site within the Vasse vegetation complex, which is described as a mixture of the closed scrub of *Melaleuca* species, fringing *Eucalyptus rudis* – Melaleuca species woodlands, as well as tuart – jarrah – marri open forests. South of the Capel River, it also includes areas dominated by *Tecticornia* and *Salicornia* species (Webb *et al.* 2016). The *Swan Coastal Plain Vegetation Complex Statistics Report* (Webb *et al.* 2016) states that 4,924 ha of the complex remains, representing over 31% of its original pre-European extent with 13% protected in the reserve system.

During the flora and vegetation survey, vegetation within the subject site was described as cultivated pasture intersected by areas of the coastal saltmarsh vegetation community. The pasture grasses include **Lolium rigidum, *Avena barbata* and **Bromus diandrus.* Other exotic taxa in the pastured areas include **Solanum linnaeanum, *Ornithopus compressus, *Lotus subbiflorus* and **Romulea rosea* var. *australis* (Accendo 2020).

The coastal saltmarsh vegetation community within the subject site is dominated by *Salicornia quinqueflora*. Associated species include *Senecio condylus*, **Lolium rigidum*, a Chenopodiaceae species and another unidentifiable monocot species (Accendo 2020). The eastern portion of the coastal saltmarsh vegetation community is in 'Excellent' condition, with only a minor presence of weeds. The western patch

the coastal saltmarsh vegetation community was determined to be in a 'Degraded' condition due to the high degree of weed invasion by non-native grasses and **Carex divisa* (refer to **Figure 4**).

The remainder of the subject site is in a 'Completely Degraded' condition as it has lost much of its original natural botanical value from its conversion to agricultural pasture.

Threatened Ecological Communities

As previously discussed, the coastal saltmarsh vegetation within western portion of the subject site was determined to be in a 'Degraded' condition. With over 50% cover of weed species, this vegetation does not comply with the criterion for the coastal saltmarsh vegetation community TEC.

The coastal saltmarsh vegetation community within the eastern portion of the subject site forms part of the 'Subtropical and Temperate Coastal Saltmarsh', which is listed as a TEC under the EPBC Act and as a Priority 3 community pursuant to State policy. It is connected and continuous with the saltmarshes of the adjacent Vasse-Wonnerup wetland, which is considered part of the same TEC (DBCA 2019). A key criterion to be considered part of the TEC is a continuous or intermittent saltwater influence. The Wonnerup surge barrier, which is located nearby and downstream of the subject site, prevents flooding of low-lying land during winter storms and restricts connection to the ocean during this period. However, fish gates are opened during summer to allow saltwater to enter the estuary to inhibit the formation of algal blooms (DWER 2018). During this period, the saltmarshes within the subject site are subject to some saltwater influences from the ocean.

3.7.3 Environmentally Sensitive Areas

Section 51B of the EP Act allows the Minister to declare an Environmentally Sensitive Area (ESA). Once declared, the exemptions to clear native vegetation under the regulations do not apply in these areas. TECs, areas within 50 m of any Declared Rare Flora and defined wetland areas constitute ESAs. However, a number of other areas of environmental significance are also listed. Current declared ESAs are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

The subject site, in addition to the wetland area spanning from Peppermint Grove to West Busselton, is located within an ESA. This mapping is attributed to proximity to the Vasse-Wonnerup wetland, a Ramsar and CC wetland.

3.8 Fauna

3.8.1 Fauna of Conservation Significance

A search of the DBCA's Threatened Fauna database was undertaken to establish whether species declared as 'Rare or likely to become extinct' (Schedule 1), 'Birds protected under an international agreement' (Schedule 3) and 'Other specially protected fauna' (Schedule 4) as listed under the *Biodiversity Conservation Act 2016* have been recorded in proximity to the subject site. The NatureMap Report identified four Threatened fauna species, two Priority 4 fauna species, eight fauna species protected under international agreement and one other specially protected fauna species as occurring within 2 km of the subject site (refer to **Table 3**).

The EPBC Act Protected Matters Search Tool (PMST) also identified several Threatened and Migratory species that could potentially occur within or in proximity to the subject site. This included three species classified as Vulnerable, two Endangered species, one Critically Endangered species and 20 Migratory bird species (refer **Table 3**).

The DBCA database search results are based on recorded occurrences of individuals and therefore are considered more accurate than the PMST results which are typically a product of modelled distributions of species.

The likelihood of each of the fauna species occurring within the subject site is shown in **Table 3** below. The Threatened/Migratory marine species have been excluded from the likelihood table as the subject site is not directly connected to the ocean.

The conservation significant fauna species considered likely to occur within the subject site are waders and waterbirds. This is on the basis that fauna habitat within the subject site is exclusively restricted to the coastal saltmarsh vegetation community TEC. It is also noted that the Vasse-Wonnerup wetland provides habitat for more than 30,000 waterbirds, being one of the most significant waterbird habitats in Western Australia.

Table 3. Significant fauna potentially occurring within the subject site as identified by State and Commonwealth database searches.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Apus pacificus subsp. *pacificus* (Fork-tailed Swift)	IA	Migratory	Unlikely. No records of the species occurring in the area.
Actitis hypoleucos (Common Sandpiper)	IA	Migratory	Likely. The species is found in a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity. May utilize area associated with the coastal saltmarsh vegetation community.
Ardea ibis (Cattle Egret)	IA	Migratory	Likely. This species is widely distributed in a wide range of wetland habitats and usually frequents shallow waters. May utilize area associated with the coastal saltmarsh vegetation community.
Ardea modesta (Eastern Great Egret)	IA	Migratory	
Ardea alba (Great Egret)	IA	Migratory	
Anous tenuirostris melanops (Australian Lesser Noddy)	S1	Vulnerable	Unlikely. Lack of suitable habitat within the subject site.
Botaurus poiciloptilus (Australasian Bittern)	S1	Endangered	Unlikely. No suitable habitat (i.e. absence of tall reeds and sedges).
Calidris acuminata (Sharp-tailed Sandpiper)	IA	Migratory	Possible. The species is known to occur inland in saline environments.
Calidris canutus (Red knot)	S1	Endangered	Unlikely. No records of the species occurring in the locality.
Calidris canutus (Red-necked Stint)	IA	Migratory	Likely. Known to forage on intertidal flats in the locality.
Charadrius bicinctus (Double-banded Plover)	IA	Migratory	Unlikely. Not found within the locality.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Charadrius ruficapilluss (Red-capped Plover)	IA	Migratory	Likely. The species is known to inhabit estuarine habitats.
Falco peregrinus (Peregrine Falcon)	S	-	Possible. This species is found in a wide variety of habitats.
Haliaeetus leucogaster (White-bellied Sea Eagle)	IA	Migratory	Possible. This species is found in coastal habitats and terrestrial wetlands. They are known to occur in estuaries.
Hydroprogne caspia (Caspian Tern)	IA	Migratory	Unlikely. Not found within the locality.
Limosa lapponica (Bar-tailed Godwit)	IA	Migratory	Unlikely. Not found within the locality.
Isoodon obesulus subsp. fusciventer (Quenda)	P4	-	Unlikely. Absence of suitable habitat.
Merops ornatus (Rainbow Bee-eater)	IA	Migratory	Possible. Found in a wide variety of habitats, often near permanent water. Unlikely to rely on the subject site for habitat.
Motacilla cinereal (Grey wagtail)	IA	Migratory	Unlikely. Not found within the locality.
Numenius madagascariensis (Eastern Curlew)	S1	Critically Endangered	Unlikely. Not found within the locality.
Oxyura australis (Blue-billed Duck)	P4	-	Possible. Known to occur in fresh to saline wetlands that may be artificial. May utilize area associated with the coastal saltmarsh vegetation community.
Pandion haliaetus (Osprey)	IA	Migratory	Unlikely. Not found within the locality.
Pseudocheirus occidentalis (Western Ringtail Possum)	S1	Vulnerable	Unlikely. No suitable habitat.
Thalasseus bergii (Crested Tern)	IA	Migratory	Unlikely. Not found within the locality.
Thinornis rubricollis (Hooded Plover)	P4	Migratory	Possible. Known to occur inland from the edges of lakes, on nearby grassy freshwater seepages, and in estuaries.
Tringa glareola (Wood Sandpiper)	IA	Migratory	Likely. The species is typically found in well vegetated, freshwater wetlands dominated by tall fringing vegetation. It is rarely found in brackish wetlands. It is known to use artificial wetlands. Known to occur in the Vasse-Wonnerup estuary.
Tringa nebularia (Common Greenshank, greenshank)	IA	Migratory	Likely. The species is found in a wide variety of inland waters and sheltered coastal habitat of varying salinity. It is known to use artificial wetlands. May utilize area associated with the coastal saltmarsh vegetation community.

Species	DBCA Status	EPBC Act Status	Likelihood of Occurrence
Tringa stagnatilis (Marsh Sandpiper)	IA	Migratory	Unlikely. Not found within the locality.

Of the abovementioned species, eight migratory bird species are considered likely to occur within or adjacent (Vasse-Wonnerup wetlands) to the subject site. No threatened species are considered likely to inhabit the subject site.

Habitat for migratory bird species within the subject site is restricted to the coastal saltmarsh vegetation community TEC. The pasture areas within the subject site do not provide habitat for wetland fauna. Accordingly, waterbirds within the subject site may only occur as vagrants given the substantial area of coastal vegetation available in proximity to the subject site.

3.9 Aboriginal Heritage

All Aboriginal sites in Western Australia are provided protection under the *Aboriginal Heritage Act 1972* in which it is an offence for anyone to excavate, damage, destroy, conceal or in any way alter an Aboriginal site without the Minister's permission.

An online search for relevant Aboriginal heritage information was undertaken using the Department of Planning, Lands and Heritage (DPLH) Aboriginal Inquiry System that incorporates both the heritage site register and the heritage survey database (DPLH 2020). The Aboriginal Heritage Site Register is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* and contains information on over 22,000 listed Aboriginal sites throughout Western Australia.

Results from the database search indicated that the north-western corner of the subject site is mapped within the Other Heritage Place 4566 (Cable Sands Skull) (refer to **Figure 5**). Accordingly, it may be necessary to further liaise with the DPLH to determine the status and restrictions associated with the registered site.

Based on extent of disturbance (i.e. no ground disturbing works), it is not anticipated that this heritage listing will present a significant constraint to the proposed development.

4 POTENTIAL IMPACTS AND MANAGEMENT

During the process of undertaking this investigation, a range of specific environmental issues were explored in relation to the subject site and the proposed development. These issues arise from the proposed development, the existing environment of the subject site, its surrounds and the prevailing state and federal environment policy and legislation. The implications associated with the issues in the context of the intended development of the subject site are discussed in this Section.

4.1 Acid Sulfate Soils

The subject site is classified as having a high to moderate risk of ASS occurring within 3 m of the natural soil surface (DWER 2020). In an undisturbed state below the water table, these soils remain benign and non-acidic. However, if these soils are exposed to the atmosphere through drainage, excavation or dewatering, the sulfides may react with oxygen and form sulfuric acid.

4.1.1 Management Measures

The principal management objective for ASS within the subject site is to ensure that any future development that may disturb ASS is appropriately managed to avoid impacts on the environment.

The proposed building envelope is located outside of the mapped floodway, and within the flood fringe. Accordingly, clean fill will be imported to create a sand pad at a finished floor level of 3.0 m AHD for both the house and the effluent disposal area. This will provide significant clearance from the natural ground level denoting that excavation works below the natural ground level are not anticipated.

There will be no connections to underground services (i.e. power, reticulated water), with above-ground power provided to the dwelling.

On this basis, there are not expected to be any disturbances to potential ASS material.

4.2 Wetlands

The EPA's objective for inland waters is '*to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*' (EPA 2018).

A Conservation Category and Ramsar wetland, namely the Vasse-Wonnerup wetland, is located to the east of the subject site.

4.2.1 Management Measures

The buffer adjoining a wetland helps to maintain the ecological processes and functions associated with the wetland, and aims to protect the wetland from potential adverse impacts. A buffer can also help to protect the community from potential nuisance insects. To maintain wetland values, it is important to determine, protect and manage an adequate buffer.

DBCA recommends a minimum 50 m buffer distance for Conservation Category wetlands that are to be protected (DPaW 2015). The 50 m buffer distance is considered to be generic and can be amended based on the values of the wetlands to be protected.

In consideration of the conservation significance of Vasse-Wonnerup wetland and onsite constraints, site specific buffers have been formulated in consideration of weed infestation and migratory bird habitat.

Based on the above, the proposed building envelope and effluent disposal area will be setback approximately 300 m from the mapped boundary of the Conservation Category wetland. A 100 m setback

is the recommended separation distance to minimise impacts associated with weed infestation and migratory bird habitat (WAPC 2005).

The subject site is contained within a mapped MU wetland. MU wetlands are assessed as possessing few remaining ecological attributes and functions. While such wetlands can still contribute to regional or landscape ecosystem management, including hydrological function, they are considered to have low intrinsic ecological value. Typically, they have minimal or no native vegetation remaining (less than 10%). Accordingly, there is no legislative requirement to protect or retain them and as such MU wetlands do not usually preclude development.

The management objective for MU wetlands is to preserve the hydrological functions in the context of the proposed development (EPA 2008). The proposed building envelope and driveway has been strategically located and designed to maintain existing hydrological functions, thereby complying with the management objectives associated with MU wetlands.

The current water cycle on the subject site consists of inputs from rainwater being infiltrated on site. The development is not proposing to significantly alter this process, except for the importation of potable water to top up rainwater tanks, as required. The proposed development consists of a closed cycle, with rainwater water being captured on site and reinfiltrated via the proposed effluent disposal site.

In consideration of the above measures, there are not anticipated to be any direct impacts to wetlands of conservation significance as a result of the proposed development.

4.3 Wastewater Management

Effluent or domestic wastewater is derived from bathrooms, kitchens, laundries and toilets. It contains human waste (containing pathogens), paper, soap, detergent residues and food scraps (DoW 2010). The *Government Sewerage Policy* (DPLH 2019) provides a best practice approach for the provision of onsite sewage treatment and disposal.

It is understood that the subject site is not located on a reticulated water or wastewater supply network. Accordingly, onsite wastewater management will be required for the proposed building envelope.

The subject site is located within a sewage sensitive area (specifically within the estuary catchments on the Swan and Scott Coastal Plains) (DPLH 2019). In addition, the subject site is located within the specified area prescribed in the '*Vasse Wonnerup Wetlands and Geographe Bay Water Quality Improvement Plan, 2010*' (WQIP), specifically in the Sabina River catchment.

Pursuant to the WQIP, the Sabina River has been classified as a 'recovery' catchment, whereby waterways currently do not meet the water quality criteria of 0.1 mg/L for total phosphorus and 1.0 mg/L for total nitrogen. The management objectives for this catchment are to decrease median winter nitrogen and phosphorus concentrations to 1.0 mg/L and 0.1 mg/L, respectively. These water quality management objectives will require consideration when determining onsite effluent treatment and disposal requirements.

A *Site and Soil Evaluation* (WML 2020) was undertaken for the subject site to determine the capacity of the site for onsite effluent disposal in consideration of the *Government Sewerage Policy* (DPLH 2019). Several options were considered for both the treatment system and land application area (LAA). Based on a site-specific investigation, it was recommended to treat the sewage wastewater to a secondary level using an Aerobic Treatment Unit (ATU) with nutrient removal by a suitable Department of Health (DOH)-approved treatment system. The treated wastewater shall then be applied to an elevated LAA via sub-surface drip irrigation (WML 2020).

In summary, the *Site and Soil Evaluation* (WML 2020) deemed onsite effluent disposal suitable pursuant to the *Government Sewerage Policy* (DPLH 2019) based on the following:

- Secondary treatment with nutrient removal of the sewage wastewater with an Aerobic Treatment Unit is required.
- A minimum LAA of 150 m^2 is required.
- The land application system should be comprised of sub- surface drip irrigation.
- Clay loam fill shall be imported for the LAA to provide a suitable soil for nutrient removal.
- The LAA should be bunded and sloped away from the wetland to prevent contamination from stormwater runoff.
- There are ongoing landowner obligations to ensure that operation and management of the treatment and disposal system is regularly maintained in accordance with relevant health regulations and manufacturer's recommendations.

4.3.1 Management Measures

Design specifications of the proposed secondary treatment system, including the location and discharge mechanisms (i.e. land application areas or discharge outlets) should be undertaken in accordance with the recommendations provided in the *Site and Soil Evaluation* (WML 2020). This assessment considers the specific site constraints present within the subject site including the estimated hydraulic and nutrient load, soil texture and category, and clearances to groundwater. Future Lot owners will be informed of these requirements prior to the purchase of the subject site and as part of development approval will need to apply to construct or install a wastewater treatment system.

4.4 Vegetation and Flora

The EPA objective for flora and vegetation is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*' (EPA 2016). Where a proposal may potentially impact upon flora and vegetation values, the following mitigation hierarchy should be applied to minimise potential impacts:

1. Avoid impacts.

2. Minimise impacts.

3. Offset impacts.

The proposed building envelope and driveway will directly impact approximately 2,010 m^2 of remnant vegetation in a Degraded condition.

4.4.1 Management Measures

The vegetation subject to disturbance does not contain any conservation significant flora or represent habitat critical for the survival of waterbirds, due to the high degree of weed invasion. The configuration of the building envelope has been informed by the onsite flora and vegetation survey (Accendo 2020) to protect areas of increased environmental values, namely the coastal saltmarsh vegetation community TEC.

Accordingly, as an avoidance mechanism, the building envelope has been setback as far as practicable, to achieve an approximate 75 m setback to the TEC. It is noted that within the DWER document *A guide to the assessment of applications to clear native vegetation* (2014), in reference to TECs it is stated that buffers should be determined on a case-by-case basis and in relation to the characteristics of the ecological communities being protected, and the surrounding land uses. In consideration of the long-term high level of disturbance within the subject site and the surrounding land uses, a buffer of 75 m is considered

appropriate to ensure that indirect impacts to the TEC from a single dwelling are minimised as far as reasonable.

The loss of approximately 2,010 m^2 of Degraded vegetation which provides minimal environmental value is not considered to constitute a significant impact. Nonetheless, the following management measures are proposed to minimise the impacts:

- Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
- Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free; and
- Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands.

4.5 Fauna

This subject site is adjacent to the Vasse-Wonnerup wetlands which is of international importance for bird conservation for resident waterbirds and migratory shorebirds. In addition, the subject site contains an area of the coastal saltmarsh vegetation community which is recognised as an important feeding, roosting and refuge habitat for resident and migratory waterbirds.

The EPA's objective for terrestrial fauna is '*to protect fauna so that biological diversity and ecological integrity are maintained*' (EPA 2016). The application of the mitigation hierarchy has been applied to avoid or minimise impacts to terrestrial fauna where possible. In this instance, the residential dwelling has been strategically located to avoid any direct impacts to waterways and important fauna habitat. Furthermore, to minimise indirect impacts, an approximate 75 m setback to the onsite coastal saltmarsh vegetation community and 300 m setback to the Ramsar wetland, has been provided.

4.5.1 Management Measures

In the context of the proposed single dwelling development within the subject site, the environmental aspects detailed in **Table 4** have been assessed in consideration of potential impacts to waterbirds.

Table 4. Potential impacts associated with waterbirds.

Impacts	Assessment	Outcome
Weed/disease spread	The spread or introduction of weeds is a risk associated with the construction of the driveway and building envelope. Changes to the floristic and structural nature of vegetation can reduce the habitat value. Within the subject site, it is noted that livestock grazing which is the current land use, has occurred over the past 100 years and has resulted in the vegetation within the majority of the subject site being in a 'completely degraded' condition. In consideration of the proposed setbacks and existing condition of the majority of the subject site, the addition of one new residential dwelling is unlikely to pose a	Potential risks associated with weed/disease spread will be further minimised by the development and implementation of weed hygiene measures prior to and during construction. This will include the following: - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite; - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate

Impacts	Assessment	Outcome
	significant risk to fauna in association with the spread/introduction of weeds.	waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and - Weed free fill is to be used for on-site earthworks. Weed/disease spread is expected to pose negligible risk to fauna.
Loss of habitat	The proposed development will result in the removal of approximately 2,010 m^2 vegetation in a Degraded condition. The vegetation subject to disturbance does not represent habitat critical for the survival of waterbirds due to the high degree of weed invasion. The removal of a small area of marginal quality habitat will not present a significant impact to fauna of conservation significance.	Direct habitat loss is not considered a significant impact for waterbirds given that the driveway and building envelope will be restricted to the 'Degraded' vegetation which provides limited habitat values.
Light spill	Artificial lighting from the residential dwelling may cause disturbance to some terrestrial fauna. Potential impacts are the alteration of foraging activity to bats, and changes in fauna assemblage in any areas affected by light spill. Lighting may also increase the availability of prey for adaptable bats and birds by attracting insects. Light spill from a single residential dwelling within the lot will be minimal. Furthermore, the residential dwelling will be setback approximately 75m from the onsite coastal saltmarsh vegetation community and 300m from the Ramsar wetland, denoting that light spill is very unlikely to impact fauna habitat areas.	Light spill is not expected to result in a significant impact to fauna from the proposed development.
Introduction of non-endemic fauna	The introduction/increase in non-endemic fauna may lead to increased predation of waterbirds. One residential dwelling within the subject site is unlikely to significantly increase populations of non-endemic fauna.	The introduction/increase in non-endemic fauna is not expected to result in a significant impact to fauna from the proposed development.

Impacts	Assessment	Outcome
Noise	Noise generated by machinery during construction has the potential to affect fauna. Construction noise may lead to avoidance of the area by fauna. It is known that some form of habituation occurs in response to repeated noise, whereby fauna simply maintain activities in their natural habitat after an initial period of acclimatisation. Given the short-term and localised nature of construction noise, it is anticipated that the impacts of noise on fauna will be negligible. Furthermore, the addition of one new residential dwelling, with considerable setbacks to the conservation significant wetlands will produce negligible or limited impacts to waterbirds.	Noise is not expected to result in a significant impact to fauna from the proposed development.

The Vasse-Wonnerup Ramsar site comprises an area of 1,115 ha of waterbird habitat in secure conservation areas. The effect of the proposed development will be minimal at the broader scale represented by this reserve area. Therefore, the proposed development in itself is very unlikely to contribute significantly to a long-term reduction in the size of the populations of any of waterbird species of conservation significance.

5 CONCLUSION

The key environmental aspects associated with the subject site in the context of the proposed development include:

- ASS;
- Wetlands;
- Wastewater;
- Vegetation and flora; and
- Fauna.

The proposed development recognises the importance of the key environmental and landscape attributes of the subject site. Consequently, none of the identified key environmental features present as being a constraint to the proposed development. This has been achieved with the following avoidance and management measures:

- Avoidance Measures:
    - Provision of a 301 m setback from the effluent disposal area to the Ramsar and CC wetland;
    - Provision of a 75 m setback from the effluent disposal area to the coastal saltmarsh vegetation community.
    - Limiting direct impacts to an area of approximately 2,010 m^2 of Degraded vegetation with minimal environmental values.
- Management Measures:
    - Limit construction and access to the proposed building envelope and driveway as far as reasonably practicable;
    - Minimise soil disturbance and movement to limit spread of weeds, ensuring that any soil or vegetation moved within, into or out of the disturbance area is weed-free;
    - Undertake targeted weed control within the subject site for **Solanum linnaeanum* (Apple of Sodom) by a suitably qualified contractor, and to ensure no impacts to native vegetation within the samphire shrublands;
    - Implement weed and disease management measures including;
        - Machinery will be cleaned prior to entering the subject site to ensure that weed seeds and propagules are not transported between onsite;
        - All weed plant material containing seed heads, weeds that have allopathic properties and weeds that are able to reproduce vegetatively, including topsoil containing weed propagules will be disposed of to an appropriate waste management facility. Local council should be contacted for a list of disposal facilities within the local area; and
        - Weed free fill is to be used for on-site earthworks.

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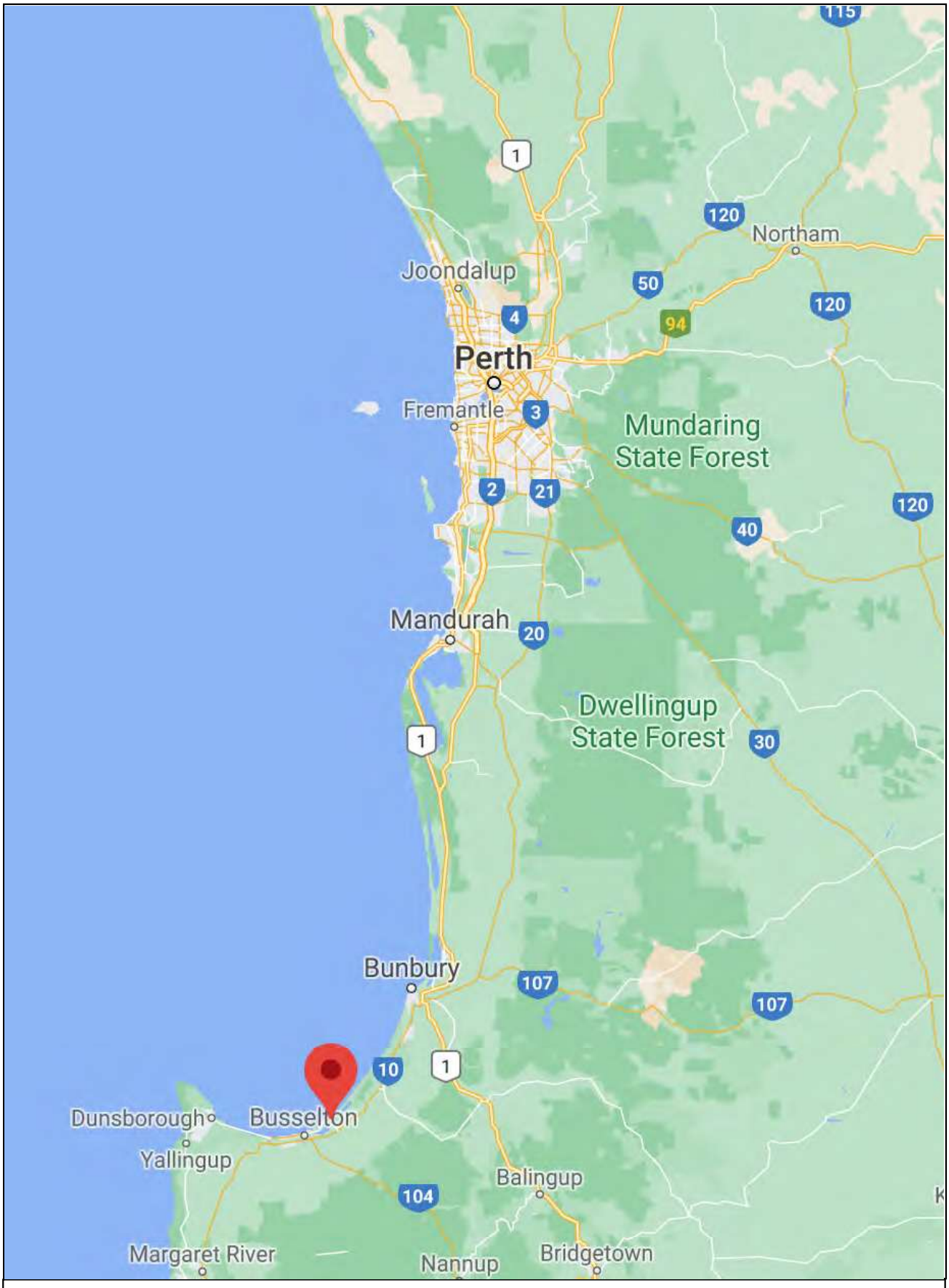
FIGURES



PROJECT	Lot 15 Forrest Beach Road, Wonnerup	Project Number	Drawing Number	Revision
		2041	Figure 1	A
DRAWING TITLE	Figure 1 – Site Locality			
		Designed PN	Checked	
CLIENT	Wonnerup Group Pty Ltd	Drawn PN	Approved	
		Date	1/10/2020	
		Local Authority	City of Busselton	
		Sheet 1 of 1		

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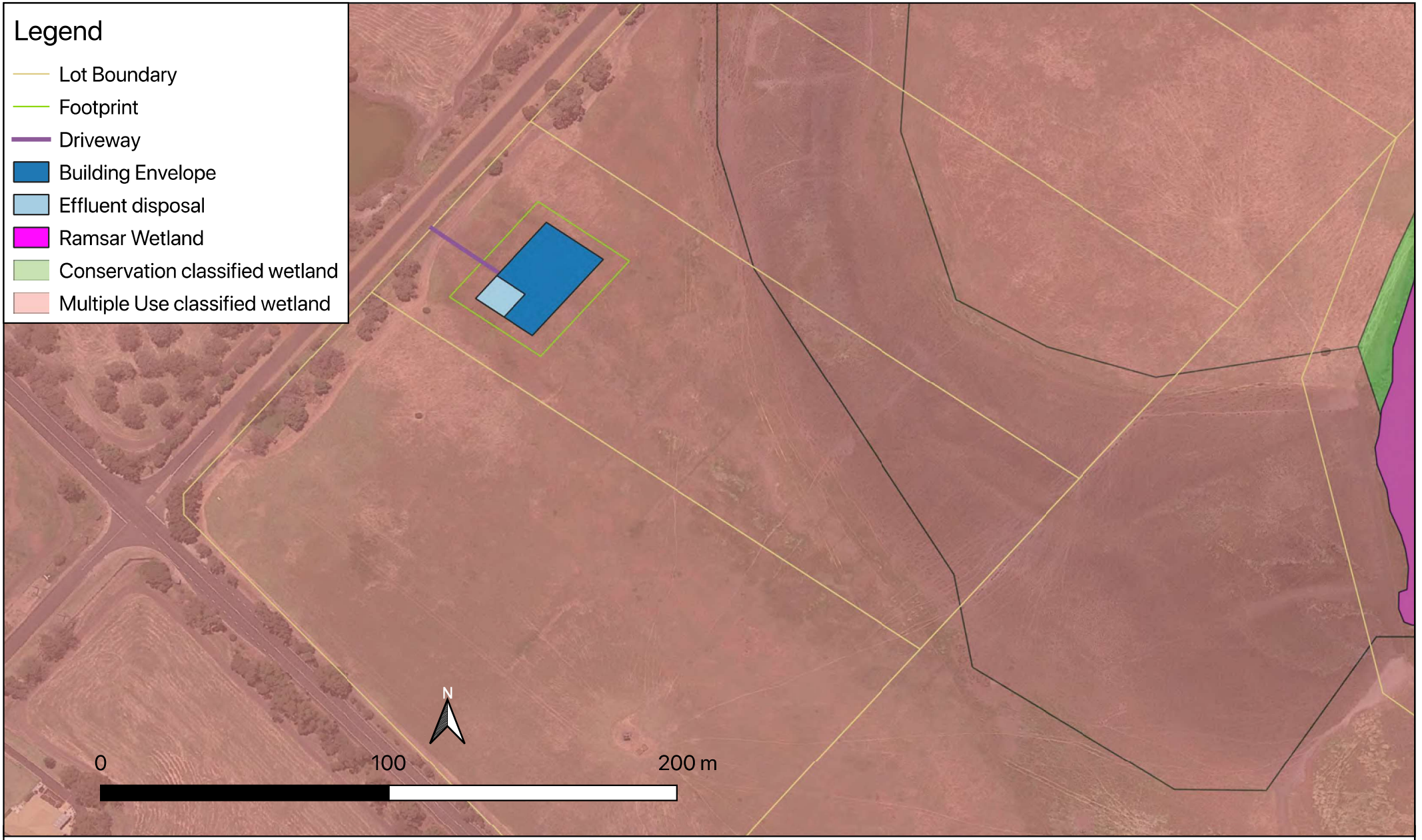

PROJECT Lot 15 Forrest Beach Road, Wonnerup

DRAWING TITLE Figure 2 Wetland Mapping

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Project Number	2041	Designed	PN
Drawing Number	Figure 2	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

PROJECT	Lot 15 Forrest Beach Road, Wonnerup
DRAWING TITLE	Figure 3 Floodplain Mapping
CLIENT	Wonnerup Group Pty Ltd

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Drawing Number	Figure 3	Drawn	PN
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Date	6/11/2020	Approved	
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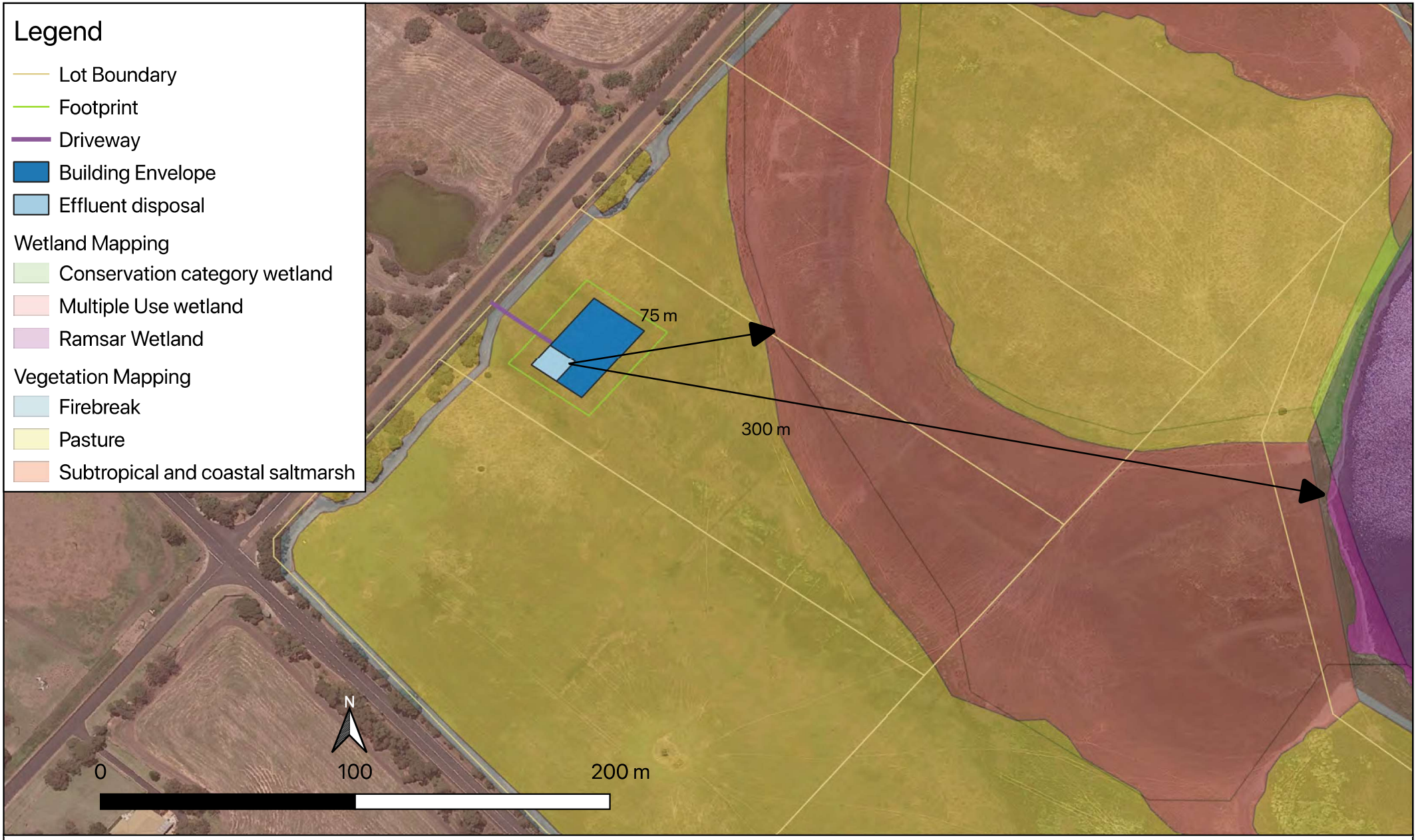

PROJECT Lot 15 Forrest Beach Road, Wonnerup

DRAWING TITLE Figure 4 Vegetation Mapping & Setback Distances

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Project Number	2041	Designed	PN
Drawing Number	Figure 4	Drawn	PN
Revision	A	Checked	
Date	8/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton

PROJECT Lot 15 Forrest Beach Road, Wonnerup

DRAWING TITLE Figure 5 Aboriginal Heritage Mapping

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Project Number	2041	Designed	PN
Drawing Number	Figure 5	Drawn	PN
Revision	A	Checked	
Date	6/11/2020	Approved	
Sheet 1 of 1		Local Authority	City of Busselton