

2.4 Is the proposed action likely to have any direct or indirect impact on the members of any listed species or any threatened ecological community, or their habitat?

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
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2.4.1 Impact table

Species or threatened ecological community	Impact
<p>Banksia Woodland of the Swan Coastal Plain Threatened Ecological Community (Endangered)</p>	<p>A total of 15.86 ha of Banksia Woodland TEC occurs within the Proposal Area (Figure 1.4). Clearing within the Proposal Area will directly impact a total of 14.11 ha of Banksia Woodland TEC. Vegetation condition of the Banksia Woodland TEC impacted within the Proposal Area was previously assessed as:</p> <ul style="list-style-type: none"> • 3.90 ha is in Excellent condition (13.3 % of the Proposal Area) • 2.20 ha in Very Good – Excellent condition (7.5 % of the Proposal Area) • 7.71 ha in Very Good condition (25.6 % of the Proposal Area) • 0.34 ha in Good condition (1.2% of the Proposal Area (Strategen 2018). <p>Through the provision of two conservation areas (Figure 1.3), the Proposal will retain 1.75 ha of Banksia Woodland TEC, 1.28 ha in excellent condition in the eastern conservation area, 0.47 ha in very good condition in the western conservation area. The retention of 1.75 ha of Banksia Woodland TEC represents 12.4% of the total Banksia Woodland TEC within the Proposal Area.</p> <p>The location of the eastern conservation area as identified in Figure 1.3, has been specifically positioned to provide direct ecological connectivity to the adjacent Boyagin Park (Figure 1.4) which contains approximately 0.71 ha of similar vegetation. Ultimately this results in a combined conservation area of 1.99 ha and ensures the vegetation with the eastern conservation area remains well above the 0.5 ha threshold, identified as a viable patch of Excellent condition Banksia Woodland TEC in the Conservation Advice (DEE 2016). The connection to the Boyagin Park will assist in ensuring the long term viability of the Banksia woodland TEC within both the eastern conservation area and Boyagin Park.</p> <p>A statistical analysis of the vegetation types within the Proposal Area was conducted as part of the vegetation and flora survey (Strategen 2018). Floristic community types (FCTs) were determined using a hierarchical clustering analysis which demonstrated only one FCT occurs within the Proposal Area, FCT 28 (Strategen 2018). FCT 28 is known to occur across a 150 km range from Red Gully north of Perth, to the Leda nature reserve south of Perth and has an average species richness of 56 species (DEE 2016). Strategen (2018) identified an average species richness of 22 species across the Proposal Area, therefore, vegetation within the Proposal Area is not a high quality representation of the FCT.</p> <p>FCT 28 occurs predominantly in the Karrakatta and Cottesloe units of the Spearwood dune system. FCT 28 is not listed as a State Priority Ecological Community (PEC) or Threatened Ecological Community and while the community is currently not under threat, the extent of this FCT is unknown; the current extents of this FCT 28 can be inferred from information on the Vegetation Complex and Vegetation Association that FCT 28 forms part of.</p> <p>Strategen (2018) identified the vegetation association across the Proposal Area as Vegetation Association 6, within the City of Wanneroo 2019 vegetation statistics, identify approximately 2,777 ha of this association remains locally within the City of Wanneroo. Additionally, 13,362 ha of the regional extent remains. Substantial extents of vegetation association 6 occur in Yellagonga Regional Park and regionally in Neerabup National Park, the loss of 14.11 ha of Vegetation Association 6 represents a reduction of 0.5% of the current local extent and 0.1% of the state-wide extent, indicating that substantial areas of the vegetation association and consequently Banksia Woodland TEC, occurs locally and regionally.</p>

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	<p>The Banksia Woodland of the Swan Coastal Plain Conservation Advice, 2016 identifies Vegetation Association 6 is a partial component of the TEC.</p> <p>At the Vegetation Complex level, the Proposal Area contains the Karrakatta Complex–Central and South. The Karrakatta Complex – Central and South has 23.5% of its pre-European extent remaining, with 34% of the currently remaining vegetation under the management of the DBCA (Government of Western Australia 2019).</p> <p>The Proposal Area occurs with 2 km of the following Bush Forever (BF) sites (Figure 2.1) which are all known or inferred to contain FCT 28:</p> <ul style="list-style-type: none"> • Yellagonga Regional Park (BF 299) • Neerabup National Park (BF 383) • Conti Road Bushland (BF 164) • Caporn Street Bushland (BF 469) • Garden park Bushland (BF 470) • High Road Bushland (BF 471) • Badgerup Lake and Adjacent Bushland (BF 327; Figure 2.1; GoWA 2000). <p>Local and regional vegetation extent mapping of known Banksia Woodland TEC vegetation complexes (Figure 2.2), identifies a total of 1,191.4 ha and 99,567.2 ha of Banksia Woodland TEC available locally (5 km) and regionally (50 km). Clearing 14.11 ha of Banksia Woodland TEC within the Proposal Area represents approximately 1.2% of what is available within 5 km of the Proposal Area and 0.01% of the remaining Banksia Woodland within 50 km.</p>
<p>Tuart Woodlands of the Swan Coastal Plain (Critically Endangered)</p>	<p>A flora study conducted by Strategen (2018), identified nine Tuarts within the Proposal Area (Figure 1.4). Strategen JBS&G (2019) undertook an assessment of the Proposal Area using the approved conservation advice for Tuart Woodlands (DEE 2019). The results identified that two distinct patches met the criteria for Tuart Woodland TEC. Two individuals did not meet the criteria to be considered a patch of Tuart Woodland TEC as each individual was separated by more than 60 m from any other patch and did not meet the minimum patch size criteria (Strategen-JBS&G 2019). Based on the assessment, Strategen-JBS&G concluded that 1.21 ha of Tuart Woodlands occurs within the Proposal Area (Figure 1.4).</p> <p>Strategen JBS&G (2019) identified a larger patch of Tuart Woodlands occurs outside of the Proposal Area to the south west. Mapping undertaken by Strategen JBS&G identified that two of the Tuart trees within the Proposal Area were in connection with the patch of Tuart Woodlands TEC outside of the Proposal Area. The removal of the two Tuarts in connection with this larger patch of Tuart Woodland TEC, will not reduce the extent of the Tuart Woodland TEC patch outside the Proposal Area, to below the threshold of consideration of a patch for Tuart Woodland TEC.</p> <p>Both patches of Tuart Woodlands TEC within the Proposal Area, were assessed as Very High condition (Strategen-JBS&G 2019), as each patch was considered to provide a habitat role. Vegetation condition mapping of the Tuart Woodland TEC within the Proposal Area is Very Good (Figure 3.2; Strategen 2019).</p> <p>Clearing for the Proposal will directly impact 0.72 ha of Tuart Woodland TEC, which includes two Tuart trees (which form part of a patch which is predominantly offsite).</p> <p>A total of 0.50 ha of Tuart Woodland TEC will be retained within the Proposal Area, in the Western Conservation Area, this equates to five Tuart trees.</p> <p>Clearing 0.72 ha of Tuart Woodlands TEC may result in indirect impacts to the patch outside of the Proposal Area through the reduction in the area to boundary ratio; however, the 0.72 ha of Tuart Woodlands proposed to be cleared, is currently impacted by a vehicle access track approximately 10 m wide dissecting the patch west to east, indicating that the area to boundary ratio of the patch outside of the Proposal Area is already impacted by historical clearing.</p>

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	<p>No evidence of Tuart recruitment was observed within the Proposal Area (Strategen 2018; Strategen JBS&G 2019), indicating the patches within the Proposal Area and directly adjacent may not be viable long term. Furthermore, given the low species richness and no threatened or priority flora species are present in the understorey, the patches are not an example of a unique ecological community.</p> <p>Minimal leaf litter was observed throughout the patches. Additionally, there is no access to a water source within or directly adjacent to the Proposal Area (Strategen 2018; Strategen JBS&G), therefore, all Tuart Woodland TEC patches within the Proposal Area offer limited fauna habitat.</p> <p>The Department of Biodiversity Conservation and Attractions (DBCA) has provided broad scale mapping of remnant extents of Tuart Woodlands across the known range of the community (DBCA 2010). None of the DBCA mapping provided has been confirmed as Tuart Woodland TEC, however, the mapping is highly likely to be representative of Tuart Woodlands TEC. Locally, the DBCA has identified approximately 86.2 ha of Tuart Woodlands to occur within Lake Joondalup approximately 500 m to the west of the Proposal Area; a further 16.9 ha of Tuart Woodlands are mapped within local street scapes, approximately 530 m north east of the Proposal Area (DBCA 2010). Further extents of 1.4 ha and 7.9 ha are mapped 370 m to the south and 840 m to the south west respectively (DBCA 2010). According to the DBCA mapping, further extents of Tuart Woodland are available within the Neerabup National Park approximately 4.7 km north, totalling approximately 350 ha (DBCA 2010).</p> <p>Clearing 0.72 ha of Tuart Woodland within the Proposal Area represents approximately 0.6% of what is available locally and approximately 0.1% the mapped regional extent, indicating the loss is not significant to the local or regional extents. Further opportunities to retain individual trees in street scapes will be sought by the Proponent in more detailed design phases.</p>
<p>Forest red-tailed Black Cockatoos <i>Calyptorhynchus banksii naso</i> (Vulnerable)</p>	<p>A Black Cockatoo habitat survey undertaken by Strategen (2018) identified a total of 26.33 ha of FRtBC moderate habitat within the Proposal Area. Strategen (2018) undertook habitat assessment using the EPBC Act Referral guidelines for three threatened black cockatoo species (DSEWPC 2012). Based on the results, Strategen determined the Proposal Area contains:</p> <ul style="list-style-type: none"> • 10.47 ha of Good to Moderate quality foraging habitat • 15.86 ha of Poor quality foraging habitat • 90 potential roosting trees. <p>A review of the FRtBC distribution maps provided by DAWE identify the Proposal Area is outside the current modelled distribution of the species (DSEWPC 2011a).</p> <p>Historically, FRtBC has remained east of Perth with limited occurrences on the Swan Coastal Plain (Johnstone et al. 2017). Recent evidence suggests the foraging range for this species is shifting northwest from its traditional distribution; however, the extent of the shift in foraging distribution has not yet been defined (Johnstone et al. 2017). During the Black Cockatoo habitat survey, no FRtBCs were observed however, evidence of foraging by FRtBC was observed throughout the Proposal Area in the form of chewed Marri nuts (Strategen 2018).</p> <p>Breeding activity within the Swan Coastal Plain has been limited to one occurrence in an artificial breeding tube on Murdoch University grounds in 2012 (Johnstone et al. 2017). The only recorded event of FRtBC breeding activity is 36 km south of the Proposal Area and occurred only once. Since this observation no further evidence of FRtBCs breeding on the Swan Coastal Plain has been recorded (Johnstone et al. 2017). Therefore, the Proposal Area is outside the breeding range for the species and does not contain breeding habitat for FRtBCs.</p> <p>Clearing for the Proposal will impact:</p> <ul style="list-style-type: none"> • 10.47 has of Good to Moderate quality foraging habitat • 14.11 ha of Poor quality foraging habitat

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	<ul style="list-style-type: none"> 85 roosting trees. <p>Based on the presence of the potential roosting habitat within the Proposal Area, Strategen (2018) determined the overall FRtBC habitat quality as Moderate.</p> <p>A Concept Plan for the Proposal (Figure 1.3) demonstrates the retention of:</p> <ul style="list-style-type: none"> 1.75 ha of poor to moderate quality foraging habitat 5 roosting trees. <p>The retention of 1.75 ha of Poor quality foraging habitat and five roosting trees results in an overall impact of 24.58 ha of moderate quality habitat for FRtBCs.</p> <p>Clearing for the proposal will result in the loss of 85 roosting trees. During the detail design stage, further considerations will be made to retain roosting trees in road reserve; however, for the purposes of this referral, all 85 potential roosting trees are proposed to be cleared by the proposed action.</p> <p>A review of the great cocky count data provided by Birdlife Australia (2019) identifies that across all survey events since 2010, only one of the four cocky count sites within 2 km of the Proposal Area has recorded observations for FRtBCs:</p> <ul style="list-style-type: none"> WANMARR002 – 1.5 km north-east. <p>FRtBC cocky counts across WANMARR002 show a total of 8 birds across all events and no FRtBCs have been observed in the last five events (Birdlife Australia 2019). The Great Cocky count results indicate that the Wanneroo area is unlikely to be contributing significant foraging and roosting habitat for the species.</p> <p>Strategen (2018) identified the vegetation association across the Proposal Area as Medium Jarrah and Tuart Woodland (vegetation association 6). Within the City of Wanneroo 2019 vegetation statistics, approximately 2777 ha of this association remain locally. Additionally, 13,362 ha of the regional extent remains (GoWA 2019). Substantial extents of vegetation association 6 occur in Yellagonga Regional Park and regionally conserved in Bush Forever sites (DBCA 2010 GoWA 2000). The loss of 24.58 ha of vegetation association 6 represents a reduction of 0.9% of the current local extent and 0.2% of the state-wide extent, indicating that substantial areas of the vegetation association occur locally and regionally to provide foraging habitat for FRtBCs.</p> <p>Clearing for the Proposal will result in impacts to 24.58 ha of moderate quality habitat for FRtBCs that includes 85 roosting trees. Given that the Proposal Area is outside the known breeding range of the species, the Proposal Area does not contain hollows suitable for breeding and no confirmed or possible breeding habitat occurs within 30 km of the Proposal Area, the Proposal will not impact breeding habitat for FRtBCs.</p>
<p>Carnaby's Black-Cockatoo <i>Calyptorhynchus latirostris</i> (Endangered)</p>	<p>A Black Cockatoo habitat survey undertaken by Strategen (2018) identified a total of 26.33 ha of CBC habitat within the Proposal Area. Strategen (2018) undertook habitat assessment using the EPBC Act Referral guidelines for three threatened black cockatoo species (DSEWPC 2012). Based on the results, Strategen determined the Proposal Area contains:</p> <ul style="list-style-type: none"> 26.33 ha of excellent quality foraging habitat 90 potential breeding and roosting trees. <p>The species of breeding trees and roosting trees include 44 Marri (<i>Corymbia calophylla</i>), 37 Jarrah (<i>Eucalyptus marginata</i>) and 9 Tuarts (<i>Eucalyptus gomphocephala</i>; Figure 1.4). None of the potential breeding trees contain hollows suitable for breeding by CBCs (Strategen 2018). Furthermore, a review of the CBC distribution maps provided by DAWE identify the Proposal Area is outside the current modelled distribution of the species (DSEWPC 2011b). No confirmed breeding areas occur within 12 km of the Proposal Area. The nearest confirmed breeding buffers occur 12.5 km to the north which form part of the Yanchep National park mega roost (Birdlife Australia 2018). Given the Proposal Areas proximity to known breeding areas and Lake Joondalup as a water resource (500 m to the west), the Proposal Area is</p>

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	<p>considered to have the potential to host breeding habitat in the future, once mature trees develop suitable hollows.</p> <p>Clearing for the Proposal will result in the loss of 24.58 ha of excellent quality CBC foraging habitat, which includes 85 potential breeding and roosting trees.</p> <p>A Concept Plan for the Proposal will retain</p> <ul style="list-style-type: none"> • 1.75 ha of excellent quality foraging habitat across two conservation areas (Figure 1.3) • 5 potential breeding and roosting trees. <p>During the detailed design stage, opportunities to retain vegetation within street scapes will be investigated during more detailed design phases; however, all 85 potential CBC breeding and roosting trees are currently being referred for clearing impacts.</p> <p>A review of the great cocky count data provided by Birdlife Australia (2018) identifies two confirmed roost sites occur within 2 km of the Proposal Area:</p> <ul style="list-style-type: none"> • JOEDGR001 – 1.5 km to the west on Lake Joondalup • WANWANR001 – 1.8 km to the north on Lake Joondalup. <p>Cocky count data for white tailed Black Cockatoos (CBC and BBCs), demonstrate these locations have shown varied counts of the nine years of available data, a total of 40 birds have been observed across both sites since 2010, all counts show zero birds across these sites in the last four monitoring events (Birdlife Australia 2019). Results of the great cocky count indicate low numbers of CBCs may be accessing the resources across the Proposal Area infrequently.</p> <p>Strategen (2018) identified the vegetation association across the Proposal Area as Medium Jarrah and Tuart Woodland (vegetation association 6), within the City of Wanneroo 2019 vegetation statistics, identify approximately 2777 ha of this association remains locally within the City of Wanneroo. Additionally, 13362 ha of the regional extent remains. Substantial extents of vegetation association 6 occur in Yellagonga regional park and regionally in Neerabup national Park. The loss of 24.58 ha of vegetation association 6 represents a reduction of 0.9% of the current local extent and 0.2% of the state-wide extent, indicating that substantial areas of the vegetation association will continue to occur locally and regionally to provide foraging and roosting habitat for Black Cockatoos.</p> <p>Clearing for the Proposal will impact 24.58 ha of excellent quality CBC foraging habitat and 85 roosting and potential breeding trees. This impact may result in significant residual impacts to CBCs foraging habitat locally. Given the fact the Proposal Area is outside the known breeding range of the species, no suitable hollows were observed within the proposal Area and no confirmed or possible breeding habitat is mapped to occur within 12 km of the Proposal Area, breeding habitat will not be impacted by the Proposal.</p>
Malleefowl <i>Leipoa ocellata</i> (Vulnerable)	This species is often found in semi-arid to arid shrubland and low woodlands. The Proposal Area consists of Banksia and Tuart woodlands which are unsuitable for species habitat and such, this species is not considered to be impacted (DoE, 2020).
Australasian Bittern <i>Botaurus poiciloptilus</i> (Endangered)	This species favours permanent and seasonal freshwater wetlands, occasionally located in tidal and estuarine environments (DoE, 2020). The Proposal Area does not impact on any wetland areas and as such, this species is not considered to be impacted.
Douglas' Broad-headed Bee <i>Hesperocolletes douglasi</i> (Critically Endangered)	While the habitat of this species is not formally identified, the most recent study which includes the collection of one specimen indicates that habitat range is located inland stretching from Ellenbrook in the south to Gngara-Moore River State Forest in the north (DoE, 2020). Based on this recent study, the Proposal Area has not been identified as potential habitat and therefore, it is not considered to cause an impact to this species.

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Woylie <i>Bettongia penicillata ogilbyi</i> (Endangered)	Preferred habitat includes tall eucalyptus forest and woodlands, dense myrtaceous shrubland, and kwongan or mallee heath (DoE, 2020). As a result of increased population growth and habitat removal, the population of this species has been condensed to small pockets of remnant vegetation, predominantly in the south west and as such, this species is not considered to be impacted.
Chuditch <i>Dasyurus geoffroii</i> (Vulnerable)	Preferred habitat of this species includes jarrah forest and woodlands of the south-west, and drier woodlands and mallee shrubland of the Wheatbelt and Goldfields (DoE, 2020). The Proposal Area does not impact on the preferred habitat of this species and as such, this species is not considered to be impacted.
Western Ringtail Possum <i>Pseudocheirus occidentalis</i> (Critically Endangered)	Species distribution is limited to patchy areas along the south coast (Albany to Walpole) and inland to the Collie River Valley (DoE, 2020). This species is listed as endemic to the south west of WA and as such, this species is not considered to be impacted.
Slender Andersonia <i>Andersonia gracilis</i> (Endangered)	This species population occur within winter wet areas of black clay, sandy clay flats of open low heath over sedge (DoE, 2020). There is no recorded vegetation within the Proposal Area described as suitable habitat and as such, this species is not considered to be impacted.
Dwarf Green Kangaroo Paw <i>Anigozanthos viridis</i> subsp. <i>Terraspectans</i> (Vulnerable)	This species occurs within winter-wet depressions of grey sandy clay loam, or grey sand, in low-post fire regenerating heath (DoE, 2020). No such habitat occurs within the Proposal Area and as such, this species is not considered to be impacted.
King Spider-orchid <i>Caladenia huegelii</i> (Endangered)	The King Spider-orchid grows in well-drained, deep sandy soils in low mixed woodlands closely associated with Banksia, Western Sheoak and Jarrah in the undergrowth (DoE 2020). The species occurs with 20 km of the coast on the Swan Coastal Plain and flowers from September to October. Habitat for this species occurs within the Proposal Area, therefore, this species was searched for during the Flora survey conducted by Strategen (2018). Survey timing was optimal for the species (September) and no individuals were observed across the Proposal Area (Strategen 2018); therefore, this species is considered not to occur within the Proposal Area.
Dwarf Bee-orchid <i>Diuris micrantha</i> (Vulnerable)	This species is known to occur in scattered population east of Kwinana south to the Franklin area. It occurs on dark grey to blackish sandy clay loam substrates in winter-wet depressions (DoE, 2020). There is no recorded habitat within the Proposal Area suitable for this species and as such, this species is not considered to be impacted.
Purdie's Donkey-orchid <i>Diuris purdiei</i> (Endangered)	This species is known to occur within sand to sandy clay soils, in areas subject to winter inundation, with scattered emergent <i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> , <i>E. marginata</i> and <i>Nuytsia floribunda</i> (DoE, 2020). This vegetation habitat was not recorded within the Proposal Area and as such, this species is not considered to be impacted.
Glossy-leafed Hammer Orchid <i>Drakaea elastica</i> (Endangered)	This species is known to occur in patches of bar sand within otherwise dense vegetation in low-lying areas adjacent to wetlands (DoE, 2020). The Proposal Area is located 700m east of the closest wetland and as such, the Proposal area does not impact on potential habitat of this species and it is not considered to be impacted.
Dwarf Hammer-orchid <i>Drakaea micrantha</i> (Vulnerable)	This species is found from Perth to Albany, in areas of recently disturbed infertile grey sand, the Dwarf Hammer-orchid flowers from September to October (DoE, 2020). Suitable habitat for this species occurs within the Proposal Area, therefore, this species was searched for during the Flora survey conducted by Strategen (2018). Survey timing was optimal for the species (September) and no individuals were observed across the Proposal Area (Strategen 2018); therefore, this species is considered not to occur within the Proposal Area.
Keighery's Eleocharis <i>Eleocharis keigheryi</i> (Vulnerable)	This species habitat is restricted to substrates of clay or sandy loam within freshwater creeks and claypans (DoE, 2020). The Proposal Area does not impact on any wetlands and as such, this species is not considered to be impacted.
Yanchep Mallee <i>Eucalyptus argutifolia</i> (Vulnerable)	This species is located on slopes or gullies close to the summit of limestone ridges, in shallow well-draining soils. No habitat suitable for this species was mapped within the Proposal Area and as such, this species is not considered to be impacted (DoE, 2020).
Narrow curved-leaf Grevillea <i>Grevillea curviloba</i> subsp. <i>Incurva</i> (Endangered)	The habitat range for this species is outlined as stretching from Muchea to Badgingarra (DoE, 2020). The Proposal Area does not occur within this range and there, this species is not considered to be impacted.

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Beaked Lepidosperma <i>Lepidosperma rostratum</i> (Endangered)	This species occurs in sandy soils of winter-wet swamps amongst low heath (DoE, 2020). No habitat was recorded within the Proposal Area as suitable for this species and as such, this species is not considered to be impacted.
<i>Marianthus paralius</i> (Endangered)	This species favours coastal heath of white sand and brown loam, over coastal limestone cliffs (DoE, 2020). The Proposal Area is 7.5 km east of the coastline and as such, this species is not considered to be impacted.
<i>Melaleuca</i> sp. <i>Wanneroo</i> (Endangered)	This species grows in very shallow soils over limestone caprock on ridges (DoE, 2020). No such habitat was recorded within the Proposal Area and as such, this species it not considered to be impacted.
Cinnamon Sun Orchid <i>Thelymitra dedmaniarum</i>	This species is often associated with <i>Eucalyptus wandoo</i> (wandoo) and <i>E. accedens</i> (powderbark wandoo) woodlands grows in red-brown sandy loam soils associated with dolerite and granite outcrops (DoE, 2020). No such habitat was recorded within the Proposal Area and as such, this species is not considered to be impacted.

2.4.2 Do you consider this impact to be significant?

Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
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