

SSD-8744305 - Biodiversity Management Sub-plan

Kingscliff High School
33 Oxford Street, Kingscliff, NSW 2487

NCA21R130245

9 December 2021



10/156 Boundary Street, West End,
QLD 4104

Phone: +61 459 244 933



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Prepared for:

Richard Crookes Constructions Pty Ltd on behalf of the Department of Education (Schools and Infrastructure NSW)
Level 3, 4 Broadcast Way
Artarmon NSW 2064

Prepared by:

Kleinfelder Australia Pty Ltd

10/156 Boundary Street, West End, QLD 4104
Phone: +61 427 421 422
ABN: 23 146 082 500

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Kevin Wormington

Dallas Milburn

Dallas Milburn

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EXECUTIVE SUMMARY

The Kingscliff High School (KHS) is undertaking a redevelopment that will include new infrastructure and buildings, the refurbishment of buildings, and associated landscaping. A Biodiversity Management Sub-Plan (BMSP) is required for the KHS. This is required under Condition B20 of the State Significant Development Compliance Matrix for the KHS. Condition B20 of the SSD-8744305 for the KHS that requires the BMSP must address, but not be limited to, the conditions in **Table 1**.

Table 1: Compliance Table for SSD-8744305 Condition B20

Condition	Compliance
Prepared by a suitably qualified and experienced person	Prepared by Dr Kevin Wormington (PhD Ecology, BAsC (Environmental Science)). Kevin has over 25 years of experience in wildlife ecology and wildlife management in Queensland and NSW. CV in Appendix 1 .
Identify areas of land where impacts on biodiversity are to be avoided as outlined in the: • Biodiversity Development Assessment Report (BDAR) prepared by Kleinfelder, dated 15 April 2021. • Bush Stone-curlew Management Plan (BSCMP) prepared by Kleinfelder, dated 5 August 2021. • Set out how these areas will be protected from construction impacts.	Generally, any area of native vegetation that is not in the development footprint will be avoided. However, there are no specific areas to be avoided due to no presence of specific habitat areas (roosting or nesting) for threatened flora and fauna in the BDAR. The BSCMP recommended the use of barriers and fencing when nest or roosting sites of the Bush Stone-curlew are found during the construction cycle. However, these sites cannot be specified until they have been observed. The above areas will be protected by the management measures in Section 3. References to Sections of the BDAR and BSCMP applicable to the BMSP are included.
Set out the measures identified in the Biodiversity Development Assessment Report to minimise, mitigate and manage impacts on biodiversity, including timing and responsibility for delivery of the measures	Measures identified in Section 5.2 of the BDAR and Section 1.5 of the BSCMP have been incorporated onto Section 3 of this BMSP.



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1 INTRODUCTION

1.1 OVERVIEW

The Kingscliff High School (KHS) is undertaking a redevelopment that will include new infrastructure and buildings, the refurbishment of buildings and associated landscaping to modernise and increase its capacity. Kleinfelder Australia Pty Ltd was engaged by Richard Crookes Constructions Pty Ltd to prepare a Biodiversity Management Sub-plan (BMSP) for the KHS. This is required under Condition B20 of the State Significant Development Compliance Matrix for the KHS. The BMSP will address, but not be limited to, the following:

- Provide information and maps that define the biodiversity values across the site.
- Outline priority investment areas on-site where biodiversity will benefit from active management and restoration.
- Map potential areas for management of threatened and significant species.
- Measures to minimise the loss of key fauna habitat, including tree hollows.
- Measures to minimise the impacts to fauna on site, including conducting fauna pre-clearance surveys prior to vegetation clearing, and building/structure demolition.
- Engagement of an appropriately qualified ecologist with experience in capturing native wildlife, to be on site for all vegetation removal activities.
- Controlling weeds and feral pests.
- An Unexpected Finds Procedure, detailing procedures and management measures to be implemented if flora and fauna is uncovered in any area not identified in the updated Biodiversity Development Assessment Report (BDAR).
- Measures to ensure biodiversity values, not intended to be impacted, are protected, including barriers and mapping of protected/'exclusion' areas.
- A program to monitor the effectiveness of the measures in the BMSP.

In addition, under Condition B20 of the SSD- 8744305 Conditions for KHS, the BMSP must address the following:

- Be prepared by a suitably qualified and experienced person/s;
- Identify areas of land where impacts on biodiversity are to be avoided as outlined in the BDAR prepared by Kleinfelder, dated 15 April 2021, and the Bush Stone-curlew Management Plan prepared by Kleinfelder, dated 5 August 2021, and set out how these areas will be protected from construction impacts.
- Set out the measures identified in the Biodiversity Development Assessment Report to minimise, mitigate and manage impacts on biodiversity, including timing and responsibility for delivery of the measures.

1.2 SITE DESCRIPTION

Kingscliff High School (KHS) is located at 33 Oxford Street, Kingscliff NSW 2487 on Lot 57 DP803814 and Lot 3 DP803772 (11.63 ha). It has suburbs to the north, a Nature Reserve to the east, Cudgeon Creek runs along the southern boundary and Kingscliff TAFE lies to the West. Both allotments have been developed with infrastructure and planted vegetation, except for a patch of remnant native vegetation on the eastern half of Lot 57 DP803814. The Development Site is the northern section of Lot 57 DP803814 (**Figure 1**) and is zoned *R3 – Medium Density Residential* under the *Tweed Local Environment Plan 2014* (Tweed LEP).

1.3 PROPOSED DEVELOPMENT

The Development Site comprises proposed development areas within Lot 57 DP803814 (**Figure 1**). These comprise the following:

- Demolition of an existing car park and construction of a new Creative and Performing Arts Building (Building O) in the north-western portion of the site (BO).
- Refurbishment of the existing car park to the east of Building O (RCP).
- New bike parking facilities in the northern portion of the site (BP).



- An extension to the south of the existing Administration Building A (EAB).
- A new hydrant booster, tank and pump room in the north-eastern portion of the site (NHB).
- Construction of the New Covered Outdoor Learning Area (COLA).
- Internal Refurbishment to three buildings (Refurb).
- Demolition of footpath and new landscaping works in three areas (NL).

1.4 LEGISLATION AND GUIDELINES

The following Commonwealth and State Government legislation and policies and Local Government environment and control plans have been considered in the preparation of this BMSP:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *Environment Planning and Assessment Act 1979* (EP&A Act).
- *Biosecurity Act 2015* (Biosecurity Act).
- *Biosecurity Regulation 2017*.
- *Biodiversity Conservation Act 2016* (BC Act).
- *Biodiversity Conservation Regulation 2017* (BCR).
- State Environmental Planning Policy (Koala Habitat Protection) 2019.

Local Environmental Planning Instruments include:

- Tweed Shire Council Vegetation Management Strategy 2004 (Tweed VMS).
- Tweed Coast Comprehensive Koala Plan of Management 2015 (Tweed Coast CKPoM).
- Tweed Local Environment Plan 2014 (Tweed LEP).
- Tweed Development Control Plan 2008 (Tweed DCP).
- Tweed Shire Coastline Management Plan 2005 (Tweed SCMP).

1.5 INFORMATION SOURCES

Information sources utilised in the development of this management plan include:

- Biodiversity Development Assessment Report (BDAR) for the Kingscliff High School (Kleinfelder 2021a).
- Bush Stone-curlew Management Plan (BSCMP) – Kingscliff High School (Kleinfelder 2021b).
- Threatened Species App (Office of Environment and Heritage NSW 2021a).
- Threatened Species Profile Database (Office of Environment and Heritage NSW 2021b).
- Birds of Australia Digital Edition (Pizzey and Knight 2014).
- 210722 SSDA Compliance Matrix – Construction and Waste Management.
- SSD-8744305 Conditions for Kingscliff High School.
- Construction Environmental Management Plan (CEMP) issue checklist
- Generic CEMP environmental safeguards (SINSW Planning Compliance Team).

Legend

 KHS Exclusion Zone

 KHS Boundary

 Lot Boundaries

 KHS Development

Biodiversity Values

 Existing Infrastructure

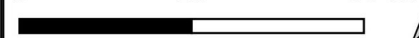
 Planted Native Vegetation/Gardens

 PCT 1064: Paperbark Swamp Forest of the Coastal Lowlands



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Project Reference: 20203914

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Drawn by: K. Wormington

Data Source:
Nearmap

Kingscliff High School Development

Biodiversity Management Sub-plans for Kingscliff Schools

Figure:

1



2 BIODIVERSITY VALUES

2.1 VEGETATION COMMUNITIES

A desktop assessment and flora survey were conducted for vegetation communities and threatened plants at the KHS in the BDAR. There were not any threatened vegetation communities mapped in the Development Site but there was planted vegetation including lawns, sporting fields and gardens. The lawns mainly consisted of *Cynodon dactylon* (Green Couch), *Digitaria didactyla* (Qld Blue Couch) and several other exotic species. The gardens generally contained native trees in the Upper Stratum, but the Mid stratum had native and exotic species co-dominant and the Ground Stratum was dominated by exotic species (**Appendix 2 and Appendix 3**). The dominant tree species in the Upper Stratum was *Eucalyptus robusta* (Swamp Mahogany) with sub-dominant trees present including *Lophostemon confertus* (Brush Box), *Brachychiton acerifolius*, *Glochidion ferdinandi*, *Banksia integrifolia*, *Archontophoenix cunninghamiana* and *Melaleuca quinquenervia*.

There was one Endangered Ecological Community, PCT 1064: *Paperbark Swamp Forest of the Coastal Lowlands*, adjacent the Development Site but still in L57 DP803814. However, it will not be disturbed. This area is mapped as an Exclusion Zone and is separated from the Development Site by a 2 m tall Fence (**Figure 1**).

New disturbance from the proposed development was estimated at 0.28 ha of planted native vegetation, gardens and lawns. Sections 3.1 and 3.2 of the KHS BDAR contain full details.

2.2 FLORA

Habitat for threatened flora species was generally absent within the KHS Development Site, given the planted native vegetation comprises maintained lawns and maintained garden beds.

The desktop assessment determined that there were 38 threatened flora species have been recorded in the vicinity (5 km) of the KHS Development Site and an Assessment of Impacts was required. The flora survey did not find any threatened flora at the KHS. However, a total of 79 flora species were identified during field surveys in three vegetation strata (**Appendix 2**). Thirty-five flora species were native (34 were endemic to region) and 44 species were exotic to the area or considered weed species.

The Assessment of Impacts for threatened flora determined that no threatened flora species would be significantly impacted. There were not any specific areas of habitat that would require avoidance due to the occupancy of threatened flora species. Sections 4.1.1, 4.1.3, 4.1.5, and 5.1.2.1 of the KHS BDAR contain the full details for the threatened flora assessments.

Three of the exotic species were listed under the Biosecurity Act. These were *Asparagus aethiopicus* (Sprenger's Asparagus), *Leucaena leucocephala* (Leucaena) and *Senecio madagascariensis* (Fireweed). *Asparagus aethiopicus* and *Senecio madagascariensis* are also a Weed of National Significance. These species were found in low abundance within the Development Site.

2.3 FAUNA

2.3.1 Habitat

Fauna habitat values observed during inspections of the Development Site were recorded. Attributes considered important to fauna include hollow-bearing trees, nests, caves, fallen timber/hollow logs, abundance of nectar and fruit resources, water bodies, vegetation cover and structural complexity, fallen timber, leaf litter and connectivity to surrounding vegetation (corridors). However, the KHS school grounds have been historically cleared (farming) and managed as lawns and gardens, which were generally devoid of distinct fauna habitat. The trees and shrubs may provide foraging and nesting habitat for bird species. One species *Eucalyptus robustus* – a preferred Koala feed tree, was observed in the KHS Development Site and school grounds. Twelve of the above species will be removed by the development.

No ground debris (i.e., logs and rocks) was detected within the KHS Development Site but small amounts of leaf litter were found throughout the gardens with the mulch, which was applied to the managed gardens. No hollow-



bearing trees were identified within the KHS school grounds, hence, no roosting or breeding habitat for hollow nesting birds or arboreal fauna was present.

2.3.2 Species

The desktop assessment of threatened fauna determined that there were three amphibians, 50 bird, 20 mammal, 3 reptile, 3 amphibians and 1 mollusc species that have been recorded in the vicinity (5 km) of the KHS (BDAR Appendix 1) and an Assessment of Impacts was required. Additionally, there were 39 migratory bird species modelled to occur within a 5 km radius of the KHS. During the field survey, two threatened species were recorded. A Bush Stone-curlew (*Burhinus grallarius*) was heard calling from outside of Development Site and the Little Bent-winged Bat (*Miniopterus australis*), listed as vulnerable under the BC Act, was detected by Anabat bat detector (**Appendix 3**). Another eighteen common bird species and one mammal were observed in the Construction Site but not any reptiles.

The habitat constraints for the Little Bent-wing Bat breeding habitat, identified in the Threatened Biodiversity Data Collection, are “Caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding”. These structures were not present within the KHS school grounds. However, the bat is likely to be using parts of the KHS Development Site for foraging. Similarly, the Bush Stone-curlew is likely to be using parts of the KHS Development Site for foraging and roosting. The Assessment of Impacts for threatened fauna determined that no threatened fauna would be significantly impacted including the Koala, Bush Stone-curlew and Little Bent-winged Bat. There were not any other specific areas of habitat that would require avoidance due to the occupancy of threatened fauna species. other than native vegetation not in the construction areas. Sections 4.1.2, 4.1.4, 4.1.6, and 5.1.2.2 of the KHS BDAR contain the full details for the threatened fauna assessments.

2.4 PRIORITY INVESTMENT AREAS

Due to the vegetation at the KHS being planted vegetation with no microhabitat for denning, roosting or nesting for any threatened species, there are no areas that could be considered priority investment areas.



3 BIODIVERSITY MANAGEMENT

3.1 OVERVIEW

Management measures include the generic environmental safeguards from the SINSW Planning Compliance Team and Section 5.2.3 of the BDAR which contains the general mitigation and management measures for biodiversity values of the KHS. In many cases the generic environmental safeguards and the BDAR management measures are aligned. These have been incorporated into this BMSP.

3.2 VEGETATION AND FAUNA MANAGEMENT

There are no threatened vegetation communities or flora in the KHS Development Site but management of the existing areas containing native vegetation is necessary. Although no threatened fauna is likely to be impacted by the development, foraging and nesting habitat for birds, foraging habitat for insectivorous bats (including the vulnerable Little Bent-winged Bat) and general habitat for ground dwelling reptiles could be disturbed. However, no hollow-bearing trees were identified within the construction area or the school grounds by the KHS BDAR. Management of hollow-bearing trees will not be required. Generic environmental safeguards prior to construction are included in **Table 2**.

Table 2: Generic Safeguards for Vegetation and Fauna Prior to Construction

No.	Environmental Safeguard
Vegetation Clearing	
1	Clearing limits will be clearly marked and all site personnel made aware of Exclusion Zones (Figure 1).
2	Trees to be retained on site will be protected with a protective barrier (e.g., paraweb fencing) so that stockpiling, parking of vehicles and other construction activities do not occur within the dripline of trees.
3	A tree protection zone (TPZ) will be established around trees to be retained. The TPZ will extend from the dripline of trees and be erected for the duration of works.
4	Native vegetation cleared from the site shall be mulched and used for revegetation, erosion protection or landscaping works.
5	Weed species shall be disposed of off-site at a nearby legally operating landfill site.
6	Trees to be retained shall be clearly identified for preservation and temporarily protected by "paraweb" fencing placed not less than 3 metres clear of trees where possible, as some retained trees may be less than 3 metres from new and refurbished buildings. There will be no stockpiling or parking of plant/machinery 3 metres from this area.
7	Limits of the site clearing shall be marked by temporary fencing.
8	No vegetation shall be burnt.
9	All trees and stumps on or within the limits of clearing which are unable to be removed by clearing methods, shall be removed by grubbing.
10	Vegetation where practical shall be retained to the greatest extent.
11	Contact shall be made with a trained wildlife handler / ecologist least 2 weeks prior to the commencement of clearing operations to allow them to prepare for the clearing and construction period.
Weed Management	
12	Areas of dense weed infestation are to be treated prior to clearing/construction activities.
13	Confirm that any proposed herbicide will not affect water quality and native flora and fauna.
Inductions	



No.	Environmental Safeguard
14*	Plant operators and employees shall be informed of the above requirement through the induction process for the site.

Note: Safeguards that were also in the BDAR Table 6 are indicated by an *.

Generic environmental safeguards during construction for vegetation and fauna management are listed in **Table 3**.

Table 3: Generic Safeguards for Vegetation and Fauna During Construction.

No.	Environmental Safeguard
Vehicles and Equipment	
1	All vehicles used during the construction process are to stay on existing or constructed roads and tracks, where practicable.
2	All earthmoving machinery accessing the Construction Site be cleaned of all soil and vegetable matter prior to entry.
3	Construction vehicle reduction in speed limits to 10 km/h in areas regarded as having higher levels of fauna activity or considered to have increased safety risk.
Vegetation	
4*	No access to any sensitive habitat areas (Exclusion Zones). All areas to be fenced and sign posted. The only Exclusion Zone is outside of the Construction Site (Figure 1) and already fenced but it may require signage.
5	Monitor works and ensure the TPZ has been appropriately established and protected.
6	All trees to be cleared shall be checked for animals before and after felling.
7	All tree pruning works will be carried out in accordance with AS 4373-1996 Pruning of amenity trees and the Code of Practice Amenity Tree Industry August 1998.
8	If additional tree clearing or substantial tree pruning is required, an arborist will be consulted prior to undertaking the works.
9	In the event of fire or vandalism resulting in the loss of tags or boundary indicators, the Contractor shall re-survey and mark where appropriate.
10	Within temporary disturbance areas that will later be allowed to regenerate, trees are to be cut off at ground level to facilitate coppicing (new growth from the base).
11	The Contractor shall implement protective measures to prevent damage to TPZs and shall ensure that no mechanical damage from plant and equipment occurs to protected areas such as: - fencing to restrict access in the immediate vicinity of an area or an individual tree. - barriers to protect trunks and exposed surface roots. - hand digging where excavation by a mechanical digger is likely to cause damage to roots and limbs. - ground cultivation to restore soil within the dripline. - tying back overhanging branches.
Fauna	
12	A wildlife carer shall be promptly notified if any native fauna is inadvertently injured during the construction works
13	The taking of domestic animals, particularly dogs and cats, onto the construction site is prohibited.
14	Ensure ongoing maintenance and monitoring of any threatened species (the Bush Stone-curlew) or significant trees within the Construction Site.



No.	Environmental Safeguard
15	If threatened species not identified in previous surveys are found during clearing surveys, and removal of individuals of these species is necessary, liaison with Department of Planning, Industry and Environment (DPIE) and further assessment is required.
16	Appropriate wildlife handling and care equipment such as leather gloves, breathable bags, blankets, ropes/ties and buckets (as recommended by the fauna handling specialist) is to be on site and with each clearing crew prior to the commencement of any clearing.

Note: Environmental Safeguards that were also in the BDAR Table 6 are indicated by an *.

Generic environmental safeguards during construction for regeneration and landscaping in relation to vegetation management are listed in **Table 4**.

Table 4: Generic Safeguards for Vegetation and Fauna Post Construction

No.	Environmental Safeguard
1	Regeneration / Landscaping of appropriate areas to begin as soon as possible after clearing and/or construction.
2	All removed trees shall be replaced with local native species of trees, shrubs and groundcover as part of the rehabilitation / landscaping plan.
3	All exposed earthworks areas shall be revegetated as per the Landscape Plan.
4	Cover plants for the purpose of soil stabilisation will be limited to certified clean seed of non-invasive annuals.

Note: Environmental Safeguards that were also in the BDAR Table 6 are indicated by an *.

Additional environmental safeguards associated with the BDAR Table 6 are listed in Table 5. However, the requirement to use tree trunks and larger branches (over 10 cm diameter) to be placed within the existing gardens or new landscaping for wildlife habitat will not be followed. This is due to the safety hazards and risk of injury to students and staff at KHS from trips and falls.

Table 5: Additional Environmental Safeguards for Vegetation taken from the BDAR.

No.	Environmental Safeguard
1	Surveys associated with the clearing and conducted by the project ecologist shall include the following procedures: ▪ The ecologist will inspect for active nests of passerine birds in trees and shrubs that will be removed or trimmed, roosting or nests for Bush Stone-curlews in gardens or areas with understorey, and inspect the lawn areas for ground nesting birds such as the Masked Lapwing (<i>Vanellus miles</i>). ▪ Active nests in the areas to be cleared shall be marked and discussions between the Ecologist and building contractor to determine the most appropriate actions. ▪ Inspect gardens for reptiles. ▪ Ceiling spaces of buildings to be refurbished, if the ceilings are being removed, should be inspected for use by insectivorous bats, possums or snakes (primarily pythons). ▪ A report of the findings and outcomes for any fauna observed or relocated from the clearance activities shall be delivered by the ecologist to the construction contractor.
2	Trees to be retained in TPZs within the Development Footprint shall have bunting installed around their drip line, to prevent any disturbance that may impact on their health; this must remain around the tree until all construction activities have been completed.
3	The areas of retained vegetation within TPZs shall be marked as 'No Go' zones. All vehicles, construction materials and refuse shall be prohibited from these areas. Compaction and the placement of fill within 5 metres of trees and native vegetation should not occur.



No.	Environmental Safeguard
4	Removal of trees and shrubs: ▪ Removal of any vegetation identified as containing nests or dreys should be undertaken carefully under the supervision of a suitable qualified ecologist or wildlife carer. The vegetation should be gently felled with the nest/drey located on the higher side of tree to avoid crushing impacts. ▪ If required, an Ecologist will be onsite where it has been determined necessary by the clearing survey. ▪ Directional clearing shall be undertaken whereby clearing will progress from the most disturbed parts of the site, working outwards towards retained vegetation, to encourage fauna to move into these areas. ▪ During any clearing, the ecologist should rescue and relocate any fauna impacted by the clearing activities to a section of the KHS school grounds with suitable habitat that will not be further disturbed. ▪ If any injured or displaced fauna are encountered onsite in the absence of an ecologist or licensed wildlife carer, the advice of the ecologist and/or a local wildlife rescue group will be sought immediately. ▪ During site inductions, all contractors, sub-contractors, and personnel must be notified of these vegetation protection requirements.
5	Cleared vegetation should be mulched and re-used throughout the site during landscaping.
6	All personnel onsite to be made aware of the sensitivity of the surrounding environmental features (e.g., if any threatened flora is identified onsite) through the induction process and a Notice Board with species known to occur in the vicinity.



To manage the Bush Stone-curlews (BSc) during the construction phase of the new development and the ongoing operations of the KHS, the Environmental Safeguards in **Table 6** are recommended.

Table 6: Additional Environmental Safeguards for Vegetation taken from the Bush Stone-curlew Management Plan.

#	Environmental Safeguards
Pre-construction	
1	Prior to the commencement of earthworks, the site should be inspected by an ecologist to ensure Bush Stone-curlews are not nesting on the site. As part of the inspection, the ecologist should seek advice from the school groundsman who may know where the birds are roosting or nesting, or where they have in the past.
2	If nesting is observed, an Exclusion Zone of at least 30 m is to be established around the nest site using an exclusion fence. The exclusion fence should allow for the non-flying chicks to move out of the nest area.
During Construction	
3	All works are to cease in the Exclusion Zone until chicks have hatched and moved from the nest site by the adults, which occurs soon after hatching.
4	Works elsewhere on the site are to be conducted under the recommendations of an ecologist, so the behaviour of the nesting birds can be monitored.
5	Where birds are observed roosting on the site, no construction work is to take place within 20 m and an unfenced BSc Protection Zone (BPZ) is to be established marked with flagging tape while the roost is in use. This is especially important if there are young birds in evidence.
6	All employees, contractors and sub-contractors working on the site will undergo site induction training and should be made aware of all matters regarding fauna management, particularly in relation to Bush Stone-curlew. All site personnel are to be made aware of the location of the nest or roosting areas (if present), the extent of the exclusion zones and when the exclusion zones are in force.
7	Posters with photographs and information of the Bush Stone-curlew should be placed on the exclusion fencing. The students should also be made aware of the Bush Stone-curlews and their management.
8	Maintain no or low artificial lighting in the construction area overnight if night work is not a part of the project. This is to prevent the birds being attracted to the area by insects around the lights.
9	The construction site should be inspected at the start of each workday to ensure no Bush Stone-curlews have entered the sites. This includes under demountable buildings and storage areas from August onwards when nesting may commence.
10	If a Bush Stone Curlew is found in the construction area, a qualified person (wildlife carer or ecologist) should be contacted to move the bird away from the construction area. Contacts for the qualified person should be established prior to construction commencing.
11	Review chemical use and storage, especially insecticides, to minimise possible effects on the Bush Stone-curlews and other wildlife.
12	Review construction site controls such as access and vehicle speed limits if Bush Stone-curlews are identified 100 m of the construction area.
13	Actions 3.5 and 3.7 of the Bush Stone-curlew Recovery Plan focus on management of habitat for this species. The provision of mulched garden beds around trees and allowing fallen branches or logs to remain can enhance roosting and nesting habitat. Local native species should predominantly be used as part of any landscaping.
14	To prevent an increase in predator activities in the school, general hygiene around the construction site should be maintained so that food scraps are not left on the ground or in places that could attract high predator use. Appropriate bins should be placed in easy to access locations, especially those for food scraps.
15	The entrance gate to the school and any gates that may be put in place for the construction should be closed at night. There is a fence around the school grounds that should be suitable for restricting dog access.
16	No animals should be brought into the school grounds by the construction crew.



#	Environmental Safeguards
Operational phase of the KHS	
17	Keep the school community informed of the potential presence of bush stone curlew particularly during breeding season to avoid harm. Agreed community lines and notifications protocols should be formalised between the stakeholders.
18	Contact Tweed Valley Wildlife Carers Inc. (TVWC) should an injured or trapped Bush Stone-curlew be detected on school grounds.
19	Maintain no / low artificial light levels at night particular towards the eastern side of the site.
20	Source and install bush stone-curlew awareness signs around the fencing of the school grounds (if required) or on Council-managed land.

3.3 WEEDS AND PEST MANAGEMENT DURING CONSTRUCTION PHASE

Generic environmental safeguards Prior to Construction are in **Table 7**.

Table 7: Generic Safeguards for Weed Management prior to Construction.

#	Environmental Safeguard
1	Weed survey to be undertaken by suitably qualified and experienced persons prior to commencement of any construction activities, including site inspections and survey. The consultant is to advise on best practice weed management techniques.
2	Weed or exotic species shall be identified and removed from the site.
3	Fertilisers and manures to be used sparingly as they can stimulate weed growth, seed set and spread.
4	Vegetation to be cleared carefully to minimise the risk of spreading weed propagules.
5	Care must be taken that weeds are not introduced to the area in manures or as contaminants in seed of the desirable species.

Generic environmental safeguards during Construction are included in **Table 8**

Table 8: Generic Safeguards for Weed Management during Construction.

#	Environmental Safeguard
1	Where possible, vehicle movement is to proceed from areas that are relatively weed free and undisturbed to more heavily weed infested areas to ensure that weed spread is not facilitated by the movement of vehicles and machinery.
2	Ongoing monitoring of the construction areas and immediate surrounds to be undertaken to check for weed growth and implement eradication measures if required.
3	Any straw bales used for erosion and sediment control must contain no seed or be wrapped in geofabric.
4	All weed species and spoil from heavily weed infested areas to be disposed off-site.
5	Pre-emergent herbicides registered for the application to be used to prevent the growth of weeds. As these may also inhibit the regeneration of native species, pre-emergent herbicides shall only be used in conjunction with planting and where weed growth is likely to be a problem, i.e., in areas with existing infestations of weeds that are significant problems for agriculture or the environment.
6	Selective grass herbicides to be used for grass weeds in areas re-vegetated with non-grass species.



#	Environmental Safeguard
6	Where possible, vehicle movement is to proceed from areas that are relatively weed free and undisturbed to more heavily weed infested areas to ensure that weed spread is not facilitated by the movement of vehicles and machinery.
7	Remove any weed waste material and have a reasonable period of site maintenance so that weeds do not re-establish.

Additional environmental safeguards associated with the BDAR are include in .

Table 9: Additional Environmental Safeguards for Weed Management taken from the BDAR.

#	Environmental Safeguard
1	Weed infestations should be controlled as required during and following construction works. Priority should be given to the control of the following species: ▪ <i>Leucaena leucocephala</i> (<i>Leucaena</i>). ▪ <i>Asparagus aethiopicus</i> (Sprenger's <i>Asparagus</i>). ▪ <i>Senecio madagascariensis</i> (Fireweed).
2	All weeds removed from the site must be transported in a sealed container or bag and disposed at a waste management facility licensed to accept green waste.
3	In particular, <i>Asparagus aethiopicus</i> , shall be extracted from the ground and taken to landfill as it could spread in green waste. Small plants can be manually removed, and larger plants can be treated by herbicide application.
4	Weed management to be undertaken by an experienced weed manger e.g., a bush regenerator.
5	The use of herbicides should be in accordance with relevant regulation and safety data sheets.
6	Bins shall be placed strategically for food scraps etc. to avoid attracting rodents, snakes, cats and dogs.

3.4 UNEXPECTED FINDS

Unexpected finds of any threatened flora or fauna species shall be recorded by the ecologist during the preclearance surveys or when in the construction area for other activities. The location it was found and the location it was translocated to, should be taken with a GPS and recorded. Appropriate actions required will be discussed between the construction contractor and the ecologist and include contact and reporting to the NSW DPIE. An Unexpected Finds register shall be kept by Richard Crookes Construction.

3.5 MONITORING PROGRAM

Due the nature of the vegetation and its clearing, the ecologist will assess that no excess vegetation has been removed at the completion of the project and provide the results to the Department of Education. Regular monitoring is not considered necessary.



4 REFERENCES

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APPENDIX 1: KEVIN WORMINGTON CV



Dr Kevin Wormington

Senior Ecologist Brisbane

Kevin has over 19 years of experience as an environmental consultant. Kevin joined Kleinfelder in 2019 as an experienced Senior Ecologist where he specialised in field ecological assessment, project management and reporting. Having also undertaken training in spatial services, Kevin is a experienced and capable in the GIS functions required for his ecological reporting including vegetation mapping.

Prior to joining Kleinfelder, Kevin ran his own small company out of Bundaberg as a means of staying in Bundaberg until his children finished their High School certificate. Kevin was also the Terrestrial Ecology Team leader in the Centre for Environmental Management at CQ University for 12 years. The CEM was a consultancy and research arm of the university.

Kevin has a high level of statistical analysis skills using a variety of univariate analysis techniques for his PhD and later learning multivariate analysis techniques using Primer 7 for freshwater ecology work.

Project Experience

Ecological assessment of four schools in Northern NSW.

The ecological assessment for the Kingscliff High School (KHS), Kingscliff Public School (KPS), Tweed River High School (TRHS) and Tweed Heads South Public School THSPS began in early 2020 with an ecological constraints assessment of the above four schools. The ecological constraints required a desktop assessment and a preliminary field survey to determine if there were any constraints associated with the schools. The outcomes of the constraints assessment was delivered in a separate report for each school, which determined that there were ecological constraints associated with schools.

Following the outcomes of the ecological constraints and the development of plans for each school, a flora and fauna assessment for the areas that would be developed at the schools was required. This required some further desktop assessments, detailed flora and fauna surveys and a Flora and Fauna Assessment Report (FFAR) for a development application (DA)

at each school.

At the completion of the FFARs an assessment of the construction programs decided that the major sections of the KHS, KPS and TRHS would be State Significant Developments and a Biodiversity Development Assessment Report (BDAR) would be required for the three above schools. The BDARS were completed along with the DA for THSPS. In addition to the BDARS and DA, there were small sections of each school developed under a different criteria and required a Review of Environmental Factors (REF) report for each the four Schools. All reports were completed successfully.

Ecological Assessment of the Ettamogah Army Stores Depot – Australian Department of Finance

A desktop analysis and field survey of the disused explosives stores at Ettamogah to determine biodiversity values of the site. Kevin participated in the flora and fauna field surveys.

A total of 73 flora species were identified within the study area during the field surveys. Thirty-one of the above were exotic species and one is a non-endemic native species. The exotic species *Rubus fruticosus* sp. agg. (Blackberry) is a listed Weed of National Significance (WoNS) and a Priority Weed for the Murray Region (relevant to the NSW Biosecurity Act 2016). One Threatened Ecological Community listed as Critically Endangered under the EPBC Act and Endangered under the BC Act was identified within the study area. This was the Box – Gum Woodland / Riparian Red Gum Woodland consistent with the Box Gum Grassy Woodlands and Derived Native Grasslands CEEC listed under the EPBC and The Box – Gum Woodland and the Riparian Red Gum Woodland are consistent with the White Box – Yellow Box – Blakely's Red Gum Woodland EEC listed under the BC Act.

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A total of 64 fauna species were detected during the field surveys, comprising 36 birds, 16 native mammals, three vertebrate pest animals, eight reptile and one amphibian species. Two species are listed Vulnerable under the BC Act, *Petaurus norfolkensis* (Squirrel Glider) and *Scoteanax rueppellii* (Greater Broad-nosed Bat).

Desktop Assessment of the Groundwater Dependent Ecosystems associated with Olive Downs A Mining Lease – Peabody Energy Australia

Kleinfelder undertook this project to determine the potential impacts if the planned open-cut mine would have any significant impacts on Groundwater Dependent Ecosystems (GDEs). Any action that may adversely affect the GDEs could result in a Significant Impact MNES under the EPBC Act or MSES under the Queensland Environmental Offset Policy (QEOP). Kevin used the information available on the rooting depths and drought tolerance of the dominant tree types in the area and compared them to the known depth of groundwater. The vegetation types included Brigalow on cracking clay soils and alluvial soils, Poplar Box woodland and Blue Gum woodlands on alluvial soils. The above information and a desktop review, using aerial photography, GIS and climate history, of similar vegetation types associated with other open-cut mines in the immediate region determined that it was unlikely that any of the GDEs associated with the project would be significantly impacted.

Ecological Assessment of the exploration activities in EPC770 / MDL174 near Wilkie Creek Coal Mine – Peabody Energy Australia.

Kleinfelder were engaged to undertake an ecological assessment (desktop) of the exploration activities in Exploration Permit for Coal (EPC) 770 and Mineral Development License (MDL) 174 5 km north-west of Dalby in the Darling Downs region of Queensland.

A desktop analysis of the study area was conducted to determine if the planned exploration activities would have any Significant Impacts on MNES under the EPBC Act or MSES under the Queensland Environmental Offset Policy (QEOP). In addition, the exploration activities would need to comply to the Eligibility Criteria and Standard Conditions for Exploration and Mineral Development – V2 which takes into account Environmentally Sensitive Areas (ESA). The assessment determined the best layout for the Drill Pads and associated tracks to minimize any impacts. An associated field survey looking at micro-habitat for fauna was able to determine location placements to minimize impacts.

Flora, Fauna and Freshwater Ecology Assessment for the EIS for the Meteor Downs South Coal Mining Lease – U & D Coal Limited

Kevin designed and implemented the site layout and methods for the desktop assessment and field survey for this project. Methods followed the guidelines in the Generic Terms of Reference, Methodology for Regional Ecosystem Mapping, Queensland Fauna Survey Guidelines, and Queensland and Federal Targeted Survey Guidelines and Ausriivas macroinvertebrate sampling procedures.

The desktop reporting detailed the vegetation communities, flora and fauna known or likely to be in area and the impacts that could occur. Freshwater ecosystems were included in the above assessment and Water Quality Objectives were identified. The terrestrial field surveys ground-truthed the vegetation communities allowing accurate mapping of those communities. The field surveys also identified flora and fauna observed in the project area. The above information was used to determine the threatening processes and where Significant Impacts on Matters of National and State Environmental Significance (MNES & MSES) would occur allowing the area where ecological offsets to be identified.

The freshwater ecology surveys also identified aquatic flora or fauna so the threatened aquatic species could be included in the above threatening processes. The freshwater ecology surveys also provided baseline data on water and habitat quality to compare to the mine influences after mining activities had begun.

Flora and Fauna Assessment of the of the Calliope Ranges Roadway Re-alignment – Department of Main Roads.

A desktop study and site inspection was carried out for a flora and fauna evaluation of the Calliope Ranges highway realignment. Two plants of conservation significance have been reported within five km of the proposed new roadway. However, only *Cycas megacarpa* was observed in the path of the proposed new roadway. Approximately 20% of the area of this species in the path of the new roadway will be impacted by the roadway construction but this should not critically reduce the population. However, it is recommended that measures could be taken to reduce, as much as possible, the area of *C. megacarpa* habitat to be cleared and better protection provided for the remaining plants by purchasing adjacent land and annexing it into the Road Reserve.

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Three species of plants, four reptiles, 21 birds and four mammals of conservation significance were listed as possibly using habitat within five km of the proposed new roadway, but most of these used habitats not found in the pathway of the new roadway. It was considered that it is highly unlikely any fauna of conservation significance will be affected by the project. However, there may be some impact on possums and gliders due to the removal of hollow-bearing trees.

Management for Biodiversity in Fenced Riparian Zones on Grazing Properties – Fitzroy Basin Association

Kevin designed, managed and reported on the project for the flora, mammals, birds and reptiles. The project assessed if the fencing of Riparian Zones enhanced biodiversity within the riparian zone and adjacent area. Forty sites were established in five sub-catchment areas of the Fitzroy River Basin that contained a range of riparian and adjacent sites that had been traditionally managed or managed for biodiversity values, i.e. fenced riparian zone. There was evidence that in areas where grazing regimes had changed in conjunction with fencing for a period exceeding 5 years, vegetation structure was more complex and exotic plants were less numerous. Other factors influencing vegetation structure were sub-catchment, the land zone and level of clearing. The overall diversity of non-bird vertebrate species was positively influenced by the fencing and associated changed grazing regimes. Reptile and ground mammal diversity of native species was greater in the fenced riparian zones and their adjacent forested areas than the equivalent non-fenced riparian zones. Complexity of habitat was also a positive influence. In contrast, exotic vertebrates were negatively influenced by the grazing management associated with fencing of riparian zones. Generally, birds were not sensitive to the grazing management, although bird species richness, abundance and assemblages were influenced by landscape position and vegetation.

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APPENDIX 2: FLORA SPECIES LIST

No.	Scientific Name	Common Name
Upper Stratum (6m-20)		
1.	<i>Archidendron muellerianum</i>	Veiny Lace Flower
2.	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm
3.	<i>Banksia integrifolia</i>	Coast Banksia
4.	<i>Brachychiton acerifolius</i>	Flame Bottletree
5.	<i>Eucalyptus microcorys</i>	Tallowwood
6.	<i>Eucalyptus robusta</i>	Swamp Mahogany
7.	<i>Glochidion ferdinandi</i>	Cheese Tree
8.	<i>Lophostemon confertus</i>	Queensland Brush Box
9.	<i>Macaranga tanarius</i>	Heart Leaf
10.	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark
11.	<i>Syzygium paniculatum</i>	Bush Cherry
12.	<i>Toechima dasyrrhache</i>	Blunt-leaved Steelwood
13.	* <i>Eugenia uniflora</i>	Brazilian Cherry
14.	* <i>Inga edulus</i>	Ice-cream Bean
15.	* <i>Mangifera indica</i>	Mango
Mid Stratum (1-6m)		
1.	<i>Alphitonia excelsa</i>	Red Ash
2.	<i>Cinnamomum virens</i>	Red-barked Sassafras
3.	<i>Citrus australasica</i>	Australian Finger Lime
4.	<i>Cupaniopsis anacardioides</i>	Tuckeroo
5.	<i>Guioa semiglauc</i>	Native Quince
6.	<i>Macaranga tanarius</i>	Heart Leaf
7.	<i>Mallotus philippensis</i>	Green Kamala
8.	<i>Melaleuca linariifolia</i>	Snow in Summer
9.	<i>Neolitsea australiensis</i>	Green Bolly Gum
10.	<i>Neolitsea dealbata</i>	Hairy Bolly Gum
11.	# <i>Schefflera actinophylla</i>	Umbrella Tree
12.	<i>Stephania japonica</i>	Snake Vine
13.	<i>Syzygium australe</i>	Bush Cherry
14.	<i>Syzygium spp.</i>	A Lillypilly



No.	Scientific Name	Common Name
15.	<i>Waterhousea floribunda</i>	Weeping Lillypilly
16.	* <i>Aechmea gamossepal</i>	Matchstick Bromeliad
17.	* <i>Delonix regia</i>	Poinciana
18.	* <i>Dracaena spp.</i>	Dracaena
19.	* <i>Duranta erecta</i>	Sheena's Gold
20.	* <i>Dyopsis lutescens</i>	Golden Cane
21.	* <i>Eugenia uniflora</i>	Brazilian Cherry
22.	* <i>Inga edulus</i>	Ice-cream Bean
23.	** <i>Leucaena leucocephala</i>	Leucaena
24.	* <i>Ochna serrulata</i>	Ochna
25.	* <i>Philadelphus spp.</i>	Mock Orange
26.	* <i>Solanum mauritianum</i>	Bugweed
27.	* <i>Spathodea campanulata</i>	African Tulip
28.	* <i>Syagrus romanzoffiana</i>	Cocos Palm
Ground Stratum (0-1m)		
1.	<i>Cayratia clematidea</i>	Slender Grape
2.	<i>Commelina cyanea</i>	Scurvey Weed
3.	<i>Clematicissus opaca</i>	Pepper Vine
4.	<i>Cynodon dactylon</i>	Green Couch Grass
5.	<i>Cyperus gracilis</i>	Slender Flat-sedge
6.	<i>Cupaniopsis anacardioides</i>	Tuckeroo
7.	<i>Digitaria didactyla</i>	QLD Blue Couch Grass
8.	<i>Peperomia blanda</i>	A Herb
9.	# <i>Smilax australis</i>	Lawyer Vine
10.	<i>Themeda triandra</i>	Kangaroo Grass
11.	* <i>Alpinia spp.</i>	Ginger Family
12.	** <i>Asparagus aethiopicus</i>	Sprenger's asparagus
13.	* <i>Axonopus compressus</i>	Carpet Grass
14.	* <i>Bidens pilosa</i>	Cobblers Peg
15.	* <i>Cenchrus longispinus</i>	Spiny Burrgrass
16.	* <i>Conyza bonariensis</i>	Hairy Fleabane
17.	* <i>Cynodon incompletus</i>	A Grass
18.	* <i>Cyperus rotundus</i>	Nut Grass



No.	Scientific Name	Common Name
19.	<i>*Emilia sonchifolia</i>	Emilia
20.	<i>*Eragrostis tenuifolia</i>	Elastic Grass
21.	<i>*Eugenia uniflora</i>	Brazilian Cherry
22.	<i>*Gazania rigens</i>	Gazania
23.	<i>*Inga edulus</i>	Ice-cream Bean
24.	<i>*Iris spp.</i>	An Iris
25.	<i>*Lepidium spp.</i>	A herb
26.	<i>*Pennisetum clandestinum</i>	Kikuyu Grass
27.	<i>*Passiflora spp.</i>	Wild Passionfruit
28.	<i>*Plumeria rubra</i>	Frangipani
29.	<i>*Ophiopogon japonicus</i>	Mondo Grass
30.	<i>*Richardia brasiliensis</i>	White Eye
31.	<i>*Sida rhombifolia</i>	Arrowleaf Sida
32.	<i>*Salvia rosmarinus</i>	Rosemary
33.	<i>*Sansevieria trifasciata</i>	Mother-in-law Tongue
34.	<i>**Senecio madagascariensis</i>	Fireweed
35.	<i>*Senna pendula</i>	Easter Cassia
36.	<i>*Spathodea campanulata</i>	African Tulip
37.	<i>*Hypochaeris radicata</i>	Catsear

* Garden ornamental/weed species, ** Restricted weeds Biosecurity Act, # Native species not endemic to region.



APPENDIX 3: FAUNA LIST

	Common Name	Species	BC Act	EPBC Act	Number/Probability
	Birds				
1.	Australian Brush-turkey	<i>Alectura lathamii</i>			1
2.	Australian Figbird	<i>Sphecotheres vieilloti</i>			5
3.	Australian Wood Duck	<i>Chenonetta jubata</i>			2
4.	Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>			2
5.	Bush Stone-curlew	<i>Burhinus grallarius</i>	E		2
6.	Eastern Rosella	<i>Platycercus eximius</i>			2
7.	Grey Butcherbird	<i>Cracticus torquatus</i>			1
8.	Laughing Kookaburra	<i>Dacelo novaeguineae</i>			1
9.	Lewin's Honeyeater	<i>Meliphaga lewinii</i>			2
10.	Noisy Miner	<i>Manorina melanocephala</i>			5
11.	Pied Currawong	<i>Strepera versicolor</i>			2
12.	Rainbow Bee-eater	<i>Merops ornatus</i>			5
13.	Rainbow Lorikeet	<i>Trichoglossus haematodus</i>			15
14.	Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepiotus</i>			5
15.	Silver Gull	<i>Chroicocephalus novaehollandiae</i>			5
16.	Striated Pardalote	<i>Pardalotus striatus</i>			2
17.	Torresian Crow	<i>Corvus orru</i>			1
18.	Whistling Kite	<i>Haliastur sphenurus</i>			1
19.	White-throated Gerygone	<i>Gerygone olivacea</i>			1
	Mammals				
1.	Black Flying Fox	<i>Pteropus alecto</i>			6
2.	Little Bent-winged Bat	<i>Miniopterus australis</i>	V		Confident

E = Endangered; V = Vulnerable

