

# **Commonwealth approval EPBC 2013/6963 conditions compliance tracking and management annual report**

## **Nambucca Heads to Urunga Pacific Highway Upgrade**

February 2017 – January 2018

February 2018



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## Attachments

<b>Attachment 1</b>	In Situ Flora Monitoring and Threatened Flora Translocation Monitoring Report
<b>Attachment 2</b>	Condition Two Compliance Report
<b>Attachment 3</b>	Condition 16 translocation outcomes report

## Glossary / Abbreviations

Acronyms used in this document

<b>Acronym</b>	<b>Definition</b>
BEM	Benchmark Environmental Management
CAR	Corrective Action Request
CEMP	Construction Environmental Management Plan
Clear Milkvine	Marsdenia longiloba
Cryptic Forest Twiner	Tylophora Woollsii
Ecos	Ecos Environmental Pty Ltd
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ER	Environmental Representative - A suitably qualified and experienced person independent of project design and construction personnel employed for the duration of construction. The principal point of advice in relation to all questions and complaints concerning environmental performance.
NCR	Non Conformance Report
NGOMP	Norton and Griffin Offset Management Plan
SAP	Sensitive Area Plan
SES	Sandpiper Ecological Surveys
TFOMP	Threatened Flora Offset Management Plan
TFMP	Threatened Flora Management Plan
TFOS	Threatened Flora Offset Strategy

# Introduction

## Purpose of this document

The purpose of this document is to facilitate demonstration by Roads and Maritime Services (Roads & Maritime) of satisfactory compliance with the Commonwealth approval conditions for the Nambucca Heads to Urunga Pacific Highway Upgrade project with particular reference to Condition 24, which requires an annual report addressing compliance with each of the conditions of approval. The report covers the fourth period from February 2017 to January 2018.

For each condition, one or more actions are identified which, once implemented, will achieve satisfactory compliance with the condition. Where appropriate, the timing for completion of individual actions is identified.

For each action, the minimum relevant documentation to support demonstration of compliance is identified. This documentation would inform any future compliance audit.

Where an approval condition makes reference to information being provided to the Commonwealth Minister for the Environment, the associated action(s) assumes that this information will be provided, in the first instance, to the Commonwealth Department of the Environment.

## Key dates

The timing for compliance with certain approval conditions is linked to specific dates as follows:

- Commonwealth approval: 26 November 2013
- Start of construction: 4 December 2013
- Scheduled completion of construction: 14 February 2018
- Expiry of Commonwealth approval 1 January 2031
- Publish Annual Compliance Report 4 March 2018

## Responsibility for compliance

Responsibility for compliance with all approval conditions sits with Roads & Maritime.

## NSW planning approval

Condition 29 (of the Commonwealth approval) provides for the use of plans, strategies or reports required under the NSW approval to satisfy the requirements of the Commonwealth approval, subject to provision of a separate document demonstrating how the document addresses the relevant Commonwealth approval requirements.

Specialists in the fields of flora and fauna have been engaged by Roads & Maritime and the construction contractor to undertake various ecology-related management activities with regard to complying with the NSW planning approval and the CEMP. The following specialist had been engaged to undertake ecology related activities prior to the EPBC approval:

- Benchmark Environmental Management (BEM) has prepared an ecological monitoring program that addresses relevant matters in the NSW planning approval. The ecological monitoring program has been incorporated into the CEMP for the contractor to implement during construction.
- Ecos Environmental (Ecos) has been engaged by Roads and Maritime to prepare a Threatened Flora Translocation Program that addresses relevant matters in the NSW planning approval and has additionally been engaged by the contractor to provide advice on the implementation of the

translocation program and provide specialist advice on flora to implement other CEMP requirements.

- Sandpiper Ecological Surveys (SES) has been engaged by the contractor to provide specialist advice on fauna to implement CEMP requirements, and also to undertake the ongoing monitoring as required under the approved ecological monitoring program

This document contains actions relevant to compliance with Commonwealth approval requirements.

## Definitions for action status conditions

TBA	To Be Arranged - Further works required prior to starting action.
In progress	Action initiated but not yet complete.
Ongoing	Action in place but ongoing works required to ensure compliance.
Complete	Action completed.

## Non Compliances with EPBC Conditions

No non-compliances for the period were recorded.

## Condition 1

The person taking the action must not clear more than:

- a) 171 ha of Koala habitat;
- b) 184 ha of Grey-headed Flying-fox habitat
- c) 166 ha of Spotted-tail Quoll habitat;
- d) 73 ha of habitat for the Swift Parrot and Regent Honeyeater; and
- e) 36 ha of habitat for the Cryptic Forest Twiner and Clear Milkvine.

Action	Timing	Status	Compliance evidence
1.1 Progressive review of area cleared	Regularly during construction	Complete	Record of clearing numbers
1.2 Review outstanding clearing requirements at 75% clearing to confirm clearing limitation targets will be met	Construction (75% clearing)	Complete	Memo provided 18-6-2014
1.3 Confirm clearing limitation targets have been met	Post-construction	Complete	As built survey of actual clearing area.

Final Clearing Quantities (EN1 FDD + Additions)			
Habitat Type	Final Clearing Quantity (ha)	Limit (ha) as per Condition 1 Approval	Current Difference showing remaining habitat (ha) under Condition 1 Approval
Koala	157.89	171	13.11
Grey-headed Flying-fox	170.84	184	13.16
Spotted –tail Quoll habitat	71.40	166	94.60
Swift Parrot and Regent Honeyeater	71.40	73	1.60
Cryptic Forest Twiner and Clear Milkvine	34.11	36	1.89

Mainline clearing was completed during 2014. Small amount of clearing was undertaken throughout 2015 and 2016.

Clearing has now been completed and the table above shows the final figures for each habitat type. Clearing totals for each habitat type were below the limits in accordance with Condition 1.





## Condition 2

Within 30 days of the completion of *construction* works, the person taking action must:

- a) notify the Minister in writing of the completion of construction; and
- b) provide a report (supported by appropriate mapping) that clearly shows the location of all vegetation and EPBC species habitat cleared as a result of the action, and that demonstrates compliance with Condition 1.

Action	Timing	Status	Compliance evidence
2.1 Prepare works as executed Environmental and Clearing Plans to show extent of clearing.	Within 30 days of construction completion	Complete	See Attachment 2 for report & supporting mapping
2.2 Calculate final clearing quantity and include in summary table.	Within 30 days of construction completion	Complete	See Attachment 2 for report & supporting mapping
2.3 Provide written notification (letter) of completion of construction and report to Dept of the Environment	Within 30 days of construction completion	Complete	Notification letter Completed document transmittal form or equivalent

Completion of construction works was on 14 February 2018. A report has been produced and included in Attachment Two that shows RMS are compliant with condition one and two.

## Condition 3

The *person taking the action* must undertake progressive rehabilitation of *EPBC species' habitat* in areas where *temporary infrastructure* is to occur or, where *short term* impacts are anticipated. Where appropriate, the landscaping / rehabilitation of these areas must be done in a manner that targets the needs and requirements of *EPBC species*.

Action	Timing	Status	Compliance evidence
3.1 Finalise urban design and landscape plan to capture rehabilitation and revegetation temporary works and areas of short term impact.	Pre-construction or prior to any works in EPBC species habitat areas during construction	Approved Feb 2015	Urban Design and Landscape Plan
3.2 Implement rehabilitation / landscaping of affected areas as per landscape design.	Following cessation of use of affected areas	Completed	No EPBC species habitat was cleared as part of the creation of temporary infrastructure

Note: Urban Design Landscape Plan was approved by NSW Department of Planning (DoP) in February 2015.

Landscape planting commenced on Wednesday 4<sup>th</sup> November 2015. All permanent landscaping works have been completed across the project. Ongoing maintenance works including weed management will be undertaken by the contractor for three years following construction completion under their deed requirements.

No EPBC species habitat was cleared as part of the creation of temporary infrastructure or short term impacts as part of the project.

All sites classified as Temporary Infrastructure for the project were located in areas where no confirmed EPBC habitat was located, and also no Biometric vegetation communities were cleared for the creation of these sites i.e. located in areas previously cleared for agricultural or Forestry purposes.

## Condition 4

At completion of construction (and every three years thereafter for the life of this approval or until *the Minister* has agreed in writing that further revisions are no longer required) a progress report assessing the effectiveness of restoring habitat on site (in accordance with Condition 3) must be provided to *the Minister*.

Action	Timing	Status	Compliance evidence
4.1 Annual Compliance Report Number 3 to Dept of the Environment	March 2017	Complete	SAP's showing temporary infrastructure was not located within EPBC Species habitat (Attachment 2)

Landscape planting commenced on Wednesday 4<sup>th</sup> November 2015. All permanent landscaping works have been completed across the project. Ongoing maintenance works including weed management will be undertaken by the contractor for three years following construction completion under their deed requirements.

No EPBC species habitat was cleared as part of the creation of temporary infrastructure or short term impacts as part of the project.

All sites classified as Temporary Infrastructure for the projects were located in areas where no confirmed EPBC habitat was located, and also no Biometric vegetation communities were cleared for the creation of these sites i.e. located in areas previously cleared for agricultural or Forestry purposes.

## Condition 5

Prior to *commencement of the action* the person taking the action must engage a *suitably qualified expert* to:

- a) map any areas of habitat for EPBC species that lie adjacent to the construction zone;
- b) map the locations of known individuals of Clear Milkvine and Cryptic Forest Twiner that lie adjacent to the construction zone;
- c) map any areas of lowland rainforest of subtropical Australia that lie adjacent to the construction zone; and
- d) clearly mark exclusion zones along (or around) these areas on site.

Action	Timing	Status	Compliance evidence
5.1 Engage suitably qualified expert	Prior to start of construction	Complete	Ecos Environmental mapped vegetation and habitat types with information included in SAPs.
5.2 SAPs to show required items	Prior to construction in affected areas	Complete	SAPs drafted prior to start of construction. SAPs – amended as required with any updated information
5.3 Exclusion zones to be marked on site as appropriate	Prior to construction in affected areas	Complete	Exclusion zone delineation installed prior to construction in affected areas and maintained as required. Ongoing compliance documented through surveillance checklist.
5.4 SAPs Updated	Construction	Complete (last revised October 2014)	SAPs updated following new information or removal of sensitive area. Tracked through updated revision of the SAPs.

## Condition 6

To mitigate and reduce indirect impacts on the *exclusion zones* identified as a requirement of Condition 5, the *person taking the action* must:

- a) ensure that temporary and high visibility fencing will be erected to restrict access to *exclusion zones*. Temporary fencing must be of a design appropriate to deter the passage of vehicles or placement of construction materials, equipment and waste, in *exclusion zones* where accidental incursion could reasonably occur;
- b) implement measures to prevent the spread or establishment of new or additional weed species, soil or plant pathogens into these *exclusion zones* as a result of *construction*;
- c) implement stormwater management measures to prevent the unintentional diversion or discharge of stormwater during both construction and operation over *exclusion zones*; and
- d) implement targeted measures for managing construction impacts to *Cryptic Forest Twiner* and *Clear Milkvine* associated with dust, sedimentation and erosion.

Action	Timing	Status	Compliance evidence
6.1 Implement protection measures:			
(a) Fencing of exclusion zones	During construction	Complete	Exclusions zones installed prior to clearing. Exclusion delineation to be maintained until construction completion. Environmental surveillance checklist documenting compliance.
(b) Prevent spread of weeds, soil or pathogens	During construction	Complete	CEMP measures include implementation of Roads and Maritime best practice measures detailed in the biodiversity guidelines. Including plant wash down prior to entry onto site and separation and segregation of weed infested topsoil. Environmental surveillance checklist documenting compliance.

Action	Timing	Status	Compliance evidence
(c) Stormwater measures to prevent discharge of stormwater during construction and operation over exclusion zones	Detailed design and during construction	Complete	Detailed design includes the retention and treatment of road runoff adjacent to sensitive areas.  CEMP measures include implementation of best practice erosion and sediment controls during construction. Environmental surveillance checklist documenting compliance
(d) Implement target measures to manage construction impacts to threatened flora.	During construction	complete	Directly and indirectly impacted threatened flora removed from site through implementation of Threatened Flora Management Plan.  CEMP includes best practice measures to manage dust and erosion and sedimentation impacts. Environmental surveillance checklist documenting compliance.  Progressive revegetation to be undertaken to provide dense ground cover that excludes weeds. Revegetation checklists maintained monthly.
6.2 Monitor In-situ Roadside Threatened Flora	Every 6 months for the first two years and then yearly for 5 years.	Ongoing (Refer to Attachment 1 for Year four Summary Report)	Summary of roadside threatened plant monitoring prepared and included in the annual translocation monitoring report ( <b>Attachment 1</b> )

Monthly weed management reports are submitted by Lend Lease to Roads and Maritime. The reports identify areas of concern and track the progress of weed eradication activities.

In Situ road side threatened flora monitoring was completed in October 2017. A summary of findings are provided below;

- Of the five *in-situ* Slender Marsdenia plants being monitored, two had died back, and the remaining sites supported relatively healthy plants, with a median condition class of 2. Sites UTW3 and UTW4 each had three plants recorded close to the flagged survey point. It is uncertain if all plants were present during past surveys, or if new plants have recruited into the

sites, as only single plants had been previously recorded at these sites. Nonetheless, all plants were recorded as being in reasonable health.

## Condition 7

The *person taking the action* must engage a *suitably qualified expert* to undertake pre-clearing fauna searches within all areas proposed for disturbance, including: hollow bearing trees, logs, existing culverts and bridges, no earlier than 48 hours prior to the removal of vegetation occurring in that area to ensure that the area is free of the *Koala* and *Spotted-tail Quoll*.

Action	Timing	Status	Compliance evidence
7.1 Engage suitably qualified expert	Prior to start of construction	Complete	Sandpiper Ecological Surveys engaged by contractor in accordance with SWTC Appendix 5. (Refer to Attachment 4 Annual Fauna Monitoring Summary Report)
7.2 Pre-clearing fauna searches identified as activity in fauna management plan (or equivalent)	Prior to start of construction	Complete	BEM Ecological Monitoring Program
7.3 Undertake pre-clearing fauna searches as required	Prior to start of construction in specified areas	Complete	Environmental surveillance checklist.

- . No further clearing works are scheduled for the approved Project.
- Sections 2.1 and 3.2 of the ecological monitoring program prepared by BEM and the approved CEMP addresses undertaking pre-clearing fauna searches and fauna relocation.
- Section 5 of the ecological monitoring program prepared by BEM addresses reporting.



## Condition 8

The *person taking the action* must implement measures to relocate and/or ensure the appropriate care of individuals of *EPBC species* that are identified during searches referred to in condition 7.

Action	Timing	Status	Compliance evidence
8.1 Provide for appropriate fauna relocation measures in CEMP documentation	Prior to construction	Complete	Fauna rescue procedure contained with the FFMP. A specific koala relocation strategy has been prepared and forms an attachment to the Clearing and Grubbing Environmental Work Method Statement.
8.2 Relocate affected fauna as per procedures in ecological monitoring program	As part of pre-clearing activities	Complete	Environmental surveillance checklist.

Note:

- CEMP contains fauna rescue procedure and a specific koala relocation strategy was developed by SES in consultation with NSW EPA Senior Threatened Species Officer.
- No EPBC fauna was relocated or EPBC threatened flora observed during the reporting period.

## Condition 9

Prior to commencement of the action the person taking the action must engage a suitably qualified expert to collect baseline data on local populations of the Koala and Spotted-tail Quoll. The data must address the likely densities and distribution of these species within all habitat adjacent to the construction footprint that are likely to contain these species and that are likely to be adversely impacted by the action (as determined by a suitably qualified expert).

Action	Timing	Status	Compliance evidence
9.1 Engage suitably qualified expert	Prior to start of construction	Complete	Roads & Maritime engagement of BEM.
9.2 Review existing baseline data and assess adequacy with regard to specified matters for management of impacts on identified fauna species	Prior to completion of clearing.	Complete	Short report or equivalent documenting review outcomes and any identified information gaps
9.3 Where substantive information gaps are identified, develop strategy to obtain required information	Prior to construction activity in adjacent to areas containing potential habitat for either of the two species	Complete	Short report or equivalent documenting methodology used for monitoring, results of monitoring and compiling the new results with existing information.

### Note:

- BEM provided the report in August 2014 that consolidates actions 9.2 and 9.3. The report concluded that the local koala population in the vicinity of the Project corridor is of low density. Consequently, the available information is insufficient to determine an accurate estimate of the koala population. However, assuming there is a low density of koalas in the locality, the Project corridor appears to traverse only a small number of home ranges of individual koalas. The project design incorporates a combination of fauna exclusion fencing and fauna underpass structures within 500 metres of each sample site where koala activity was recorded. The Project is expected to have minimal impact on the viability of the local koala population by preventing direct mortalities during vegetation clearing and operation and by maintaining opportunities for safe koala movement across the Project corridor once operational.
- In reference to Spotted Tail Quolls, no quolls were identified during the study. This is not definitive evidence that the species does not occur in the study area. Whether there is a resident population is uncertain but the distribution of records and presence of recent (2010) records are sufficient to conclude that quolls utilise the study area. Quolls are predicted to occur at low densities and with heightened awareness records may be obtained during construction or in the operational phase. Given the predicted occurrence of quolls the implementation of specific measures, such as underpasses and fauna fencing is warranted to enable quolls to effectively cross the upgraded highway.
- Koala surveys completed by OEH (Jon Turbill) for Bellingen and Nambucca Shire Councils were also used to assess the need for fauna fencing. Following a meeting onsite, further fauna fencing was specified for the south of Oyster Creek. This followed Kola sightings to the immediate east of Oyster Creek during OEH monitoring. This fencing has been installed.

## Condition 10

The *person taking the action* must construct and maintain *fauna crossings* and fencing in areas that are likely to benefit the Koala and *Spotted-tail Quoll*.

Action	Timing	Status	Compliance evidence
10.1 Provide for fauna crossings and fencing in detailed design	During design	Completed	Final design showing required fauna crossings and fencing. Refer to Attachment 5 for the Underpass monitoring report.
10.2 Construct fauna crossings and fencing	Construction	Completed	Refer to Attachment 5 for the Underpass monitoring report.
10.3 Undertake regular maintenance of fauna crossings and fencing	Post-construction	Ongoing monitoring as per the Ecological Monitoring Program	Annual reporting and/or maintenance inspection reports. The 1st year of Operational phase underpass monitoring is scheduled for Year 2 of Operation (2018) as per the BEM ecological monitoring program

Note:

- Construction of the permanent fauna fencing commenced in June 2015.
- All combined /dedicated fauna crossing have been completed and installation of the vertical and horizontal refuge poles that offer connection from the mitigation structures to the adjacent native vegetation. A total of 22 combined and 4 incidental crossing have been constructed on the project
- The project scope has increased to include approximately 4km of additional permanent fauna fencing to be installed around the Waterfall Way intersection. The fencing will start at the Shortcut/South arm intersection and work its way to the northern most extent of the project. This followed the Koala road kill recorded in August 2014 immediately south of the existing Waterfall Way Interchange. This work was completed in the first half of 2016.
- Fauna Fencing was completed in August of 2016.
- Ongoing review and maintenance as required of the fauna fence has been continuing during the operational phase.

## Condition 11

The *person taking the action* must engage a *suitably qualified expert* to advise on the design and location of *fauna crossings*, fencing and road medians, for the purpose of maintaining habitat connectivity and facilitating the safe passage of the *Koala* and *Spotted-tail Quoll* across the Pacific Highway.

A *suitably qualified expert* must also be engaged to design a comprehensive monitoring program that tests the *long term success* of these measures.

Action	Timing	Status	Compliance evidence
11.1 Design development in consultation with NSW EPA Biodiversity Specialist	During design	Complete	Environmental Design Fauna Crossing Refinements report approved by NSW DP&I.
11.2 Engage suitably qualified expert to design monitoring program	Prior to start of construction	Complete	Roads and Maritime engagement of BEM
11.3 Prepare monitoring program	Prior to start of construction	Complete	BEM Ecological Monitoring Program

### Note:

- Monitoring addressed via Section 3.5 of BEM ecological monitoring program.
- The Before-After Control Versus Impact (BACI) design of the monitoring program requires the monitoring of the fauna crossings prior to the installation of the fauna fence (i.e. before the underpass structures become operational).
- The first stage of the construction phase underpass monitoring was conducted in October and November 2014. The second stage was undertaken in February and March 2015.
- The 1st year of Operational phase underpass monitoring is scheduled for Year 2 of Operation (2018) as per the BEM ecological monitoring program

## Condition 12

To inform the *long term success of fauna crossings*, fencing and road medians the *person taking the action* must engage a *suitably qualified expert* to prepare a strategy for monitoring and recording any road kill sightings of the *Koala* and *Spotted-tail Quoll* along the *Pacific Highway*. Prior to *commencement of the action*, the road kill monitoring and recording strategy must be implemented.

Action	Timing	Status	Compliance evidence
12.1 Ecological Monitoring Program to include road kill monitoring and recording strategy	Prior to start of construction	Complete	Section 3.5.3 of the Ecological Monitoring Program specifies road mortality monitoring and recording strategy
12.2 Implement strategy	Prior to start of construction and ongoing during construction	Complete	Environmental surveillance checklist. Summary provided below.
12.3 Report on outcomes of monitoring strategy	Construction Post-construction	Ongoing	Annual reporting

### Threatened Fauna Road Kill – Summary:

Date	Species	Location
22/7/2017	Koala	South Bound Carriageway, 250m north of the Kalang River
29/9/2017	Koala	South bound On Ramp of the Nambucca Heads Interchange

Two koala road kills were recorded during the reporting period, details follow;

- Koala 22/7/2017 - The animal was struck approximately 250m north of the Kalang River on the southbound carriage way. The Koala was a young female and generally presented as a healthy individual with clear eyes and good muscle definition. There was no evidence of young in its pouch. There is Fauna Exclusion fencing on both sides of the highway at that point, however an access gate near the animal was damaged and this may have been where the Koala entered the road corridor. The Gate was immediately repaired and the entire length of fauna fence was inspected to ensure no holes were present.
- Koala 29/9/2017 - The animal was struck at the southern end of the South Bound On Ramp at the Nambucca Heads Interchange. The animal was located in the gore area. There is Fauna Exclusion fencing on both sides of the highway at that point. The Fauna exclusion fence was inspected and found to be in good condition with no signs of damage.

The EPA was notified on both occasions

## 2.2 Road-kill Surveys

Road-kill surveys along the Pacific Highway were undertaken throughout the clearing phase (i.e. December to July). A weekly two-way vehicle traverse between the Waterfall Way interchange and the Nambucca Heads exit (Link Road) was conducted. The survey was conducted at speeds of 50-80kph. The single traverse was supplemented by multiple shorter traverses during weekly movement throughout the site. Care was taken to avoid duplicating records and all records subsequent to the full traverse were vetted. Data collected included: survey date, species or species group (e.g. wallaby, possum, and bird), location (distance to nearest cross-road), presence of clearing within past 48hrs and presence of safety barriers or exclusion fence. Safety requirements prohibited pedestrian access onto the existing highway and therefore it was not possible to closely inspect road-killed fauna to improve accuracy of identification.

## 3.3 Road Kill Survey

A total of 102 records of road-killed fauna were obtained between 17 December 2013 and 29 September 2014 (Table B6, Appendix B). Twenty species and several species groups (i.e. snake, bird) were identified during the survey. The ability to identify species depended on the degree to which the carcass had been degraded and location within the road alignment. Animals on the pavement were easier to identify than those on the verge.

For comparison, the sample area was divided into two sections, adjoining clearing (Link Road to 250m north Ballard's Road & 600m north Short Cut Road to Waterfall Way overpass – total of 12.71km) and no clearing (250m north Ballard's Road to 500m North Short Cut Road – total of 8.95km). Fifty-nine records occurred adjacent to the clearing section and 43 adjacent to non-cleared areas. In the clearing section six records occurred within 48 hours of clearing with a further 34 records after clearing but outside the 48 hour period. In total, 68% of records adjacent to the cleared section occurred after clearing. Between 4 July and 29 September 29 road-kills were recorded, 20 of which (or 69%) occurred in the cleared section. In comparison, of the 73 records between 17 December and 30 June 53% occurred in the cleared section.

Four records occurred in areas with concrete barriers and all were after clearing. Eight records occurred within or near the area with temporary koala fence, several of which occurred near the end of fencing. The two koala road-kills are not included in the data presented as neither was recorded during a road-kill survey.

The alignment was divided into nine sections based on the frequency of road-kills. Sections include:

- Deep Creek area - Chainage 63850-65600; 1750m (12 records; 67% after clearing).
- Valla Beach Road area - Chainage 66100-67700; 1600m (18 records; 100% after clearing).
- Burkes Lane area - Chainage 68200-69600; 1400m (10 records; 40% after clearing).
- Jacksons area - Chainage 69700-71300; 1600m (4 records; nil after clearing).
- Ballard's Road area – Chainage 71500-72750; 1250m (8 records; 50% after clearing).
- Dalhousie Creek to Tower Road; 1500m (5 records).
- Martells Road area; 1100m (9 records).
- Urunga township; 3800m (25 records).



## Condition 13

One year following the *completion of construction works*, the *person taking the action* must provide a report to *the Minister* detailing the success and/or failings of *fauna crossings*, fencing and road medians in achieving their intended purpose. The report must address (but need not be limited to):

- a) baseline data collected as a requirement of conditions 9 and 12;
- b) the number, *design* and location of *fauna crossings*, fencing and road medians, accompanied by maps and photographs;
- c) details of a monitoring program to determine the *long-term success* of *fauna crossings*, fencing and road medians (including timing, duration, methodology, and performance objectives);
- d) the success of *fauna crossings* to date; and
- e) a comparison of data / results from other projects involving upgrades to the *Pacific Highway* regarding the long-term success of fauna crossings and/or fencing;

The report must be updated on a three-yearly basis until the *long term success* of *fauna crossings* has been proven or *the Minister* has agreed in writing that further revisions are no longer required. All updated reports must be provided to *the Minister* within three years of the last report having been submitted.

Action	Timing	Status	Compliance evidence
13.1 Provide fauna crossings, fencing and road medians outcomes report to Dept of the Environment	By March 2019	TBA	Transmittal form (and any confirmation of receipt)
13.2 Provide updated fauna crossings, fencing and road medians outcomes report to Dept of the Environment	By March 2022	TBA	Transmittal form (and any confirmation of receipt)
13.3 Provide updated fauna crossings, fencing and road medians outcomes report to Dept of the Environment	By March 2025	TBA	Transmittal form (and any confirmation of receipt)
13.4 Provide updated fauna crossings, fencing and road medians outcomes report to Dept of the Environment	By 3 March 2028	TBA	Transmittal form (and any confirmation of receipt)
13.5 Provide updated fauna crossings,	By March 2031	TBA	Transmittal form (and any confirmation of



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fencing and road  
medians  
outcomes report to  
Dept of the  
Environment

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receipt)

## Condition 14

Should monitoring associated with conditions 11 to 13 demonstrate that the use of *fauna crossings* and/or fencing is not achieving its intended purpose or is having a detrimental effect upon *EPBC species* (as determined by *the Minister*), *the Minister* may request that the *person taking the action* implement alternative forms of mitigation and/or corrective actions to address the relevant impacts to *EPBC species*. Such measures must be implemented as requested.

Action	Timing	Status	Compliance evidence
14.1 Implement additional mitigation/corrective actions	As and when directed by the Minister	TBA	Annual reporting or as directed by the Minister

## Condition 15

The *person taking the action* must implement a salvage and translocation program for all individuals of *Clear Milkvine* and *Cryptic Forest Twiner* that are proposed to be cleared as a result of *the action*. Translocation procedures must be developed and implemented by a *suitably qualified expert* in accordance with *Guidelines for the Translocation of Threatened Plants in Australia* prepared by the Australian Network for Plant Conservation.

Action	Timing	Status	Compliance evidence
15.1 Engage suitably qualified expert	Prior to construction	Complete	Engagement of Ecos to prepare Threatened Flora Management Plan.
15.2 Develop translocation procedures	Prior to construction	Complete	Ecos TFMP developed in consultation with NSW EPA Biodiversity Specialist and approved by NSW DP&I.
15.3 Implement translocation procedures	During construction	Complete	Annual reporting. First report completed January 2015. Second report completed January 2016, third report completed 2017 (see Attachment 1)

### Notes:

- These two species are referenced in Section 2.7 (*Establishment of translocation areas*) of the BEM ecological monitoring program by their scientific names, ie *Marsdenia longiloba* (Clear Milkvine), and *Tylophora woollsii* (Cryptic Forest Twiner).
- A Threatened Flora Translocation Program was developed by Ecos in consultation with the NSW Biodiversity Specialist and approved by the NSW DP&I. The program includes a salvage and translocation program for all individuals of *Clear Milkvine* and *Cryptic Forest Twiner* that are proposed to be cleared and the program is considered to meet the requirements of Condition 15. The latest translocation monitoring report is available in Attachment 1.

## Condition 16

One year following the *completion of construction works*, the person taking the action must provide a report to *the Minister* detailing the long term success of the translocation program. The report must include, but need not be limited to:

- a) background information on translocated species (in relation to ecological requirements and life history);
- b) the scope of the translocation program (with respect to timing, duration, methodology, and objectives, as well as comprehensive details on the recipient translocation site(s) and how they meet the ecological requirements of each species);
- c) details of a comprehensive monitoring program to determine the *long-term success of translocation*; and
- d) the success of translocation to date.

Action	Timing	Status	Compliance evidence
16.1 Prepare translocation outcomes report addressing specified matters and other relevant matters	March 2018	Complete	See Attachment 3 for completed report
16.2 Provide translocation outcomes report to Dept of the Environment	March 2018	Complete	Transmittal form (and any confirmation of receipt)

Outcomes/progress report from the 2017 monitoring are summarised below:

### Slender Marsdenia

The current (Year 4) mean survival rate of all Slender Marsdenia plants stands at 51.8%, which is a comparatively good result.

### Woolfs's Tylophora

The current (Year 4) mean survival rate of all Woolfs's Tylophora (now known to be mostly *T. paniculata*) stands at 18.7%, with a correspondingly low median condition class score of 1. If this low survival and condition persists, then the translocation of this species will have failed all survival and condition class performance indicators. It is of interest to note the poor translocation performance of what has turned out to be a quite common species.

### Rusty Plum

Because all Rusty Plum transplants and half the Rusty Plum enhancement plantings survived through Year 1, at present Rusty Plum meets relevant performance criteria. As at Year 4, Rusty Plum transplant survival is 67%, which, if maintained, will meet ongoing performance criteria. However, the enhancement planting survival rate is currently only 15%, which equates to failure of performance criteria for Year 5, should these rates continue. This failure in performance of Rusty Plum is largely due to easily preventable browsing of enhancement plantings by wildlife.

Replenishing the enhancement plantings via direct seeding and installation of tree protectors would most likely reinstate the success of the Rusty Plum plantings.

#### Spider Orchid

The current (Year 4) survival rate of 78.3% is probably an underestimate of the actual rate of survival of Spider Orchid plants at the translocation site. Overall, the translocation of Spider Orchid plants has been successful, and it is expected that performance indicators will be met in the future for this species.

## Condition 17

The report must be updated on a three-yearly basis to provide further insights on the *long-term success* of translocation. All reports must be provided to *the Minister* and made available on the *person taking the action's* website for the life of this approval or until *the Minister* has agreed in writing that further revisions are no longer required.

Action	Timing	Status	Compliance evidence
17.1 Update translocation outcomes report (update #1) and provide to Dept of the Environment	March 2021	TBA	Completed report Transmittal form (and any confirmation of receipt)
17.2 Update translocation outcomes report (update #2) and provide to Dept of the Environment	March 2024	TBA	Completed report Transmittal form (and any confirmation of receipt)
17.3 Update translocation outcomes report (update #3) and provide to Dept of the Environment	March 2027	TBA	Completed report Transmittal form (and any confirmation of receipt)
17.4 Update translocation outcomes report (update #4) and provide to Dept of the Environment	March 2030	TBA	Completed report Transmittal form (and any confirmation of receipt)

Note:

- Uploading of the reports to the project website is addressed via compliance with Condition 29.

## Condition 18

With reference to the *department's offset policy*, the *person taking the action* must provide for the *Minister's* approval a threatened flora offset strategy for the *Clear Milkvine* and *Cryptic Forest Twiner*, within 12 months of the date of this approval. *The Minister* will only approve the Threatened Flora Offset Strategy (TFOS), if it demonstrates how a threatened flora offset meeting no less than 90 % of the direct offset requirements (as determined *by the department* in accordance with the offset user guide) will be legally secured in perpetuity within two years of the date of this approval.

Note: At the time the offset required by condition 18 is submitted for approval, the person taking *the action* may ask the Minister to consider that the salvage and translocation program required by condition 15, meets 10% of the offset requirements for the *Clear Milkvine* and *Cryptic Forest Twiner*.

Action	Timing	Status	Compliance evidence
18.1 Prepare TFOS in accordance with Dept of the Environment offset policy and addressing specified matters	By 26 Nov 2014	Completed	Completed TFOS
18.2 Submit TFOS to Dept of the Environment for approval	By 26 Nov 2014	Complete Final Report approved by DoE 19/07/2016	Transmittal form (and any confirmation of receipt)

### Action 18.1:

- Prepare brief for tender (Complete)
- Tender assessment – (Complete)
- Draft for Roads and Maritime review expected (Complete)
- Roads and Maritime review (Complete)
- Final of the TFOS (Complete)

### Action 18.2:

- Submitted to DoE for approval 21/11/2014
- Comments received from DoE 02/09/2015
- Amended report provided to DoE 02/10/2015
- Variation letter submitted to DoE on 20/11/2015 to request the removal of a timeframe to secure the offset property in perpetuity and tie that in with the approval of the TFOMP.
- Comments received from DoE 30/11/2015
- TFOS was resubmitted in 2/6/2016

- **The TFOS was approved by DoE on 19/07/2016 and was published on the projects website.**



## Condition 19

The *person taking the action* must provide a plan for the management and delivery of the offset requirements of the threatened flora offset to *the Minister* for approval no later than 30 June 2015. The Threatened Flora Offset Management Plan (TFOMP) must include, but need not be limited to:

- a) map(s) and *shapefiles* that clearly define the location and boundaries of the offset;
- b) details on the *quality* of the offset;
- c) information about *Clear Milkvine* and *Cryptic Forest Twiner* (in relation to ecology, biology and conservation status) to inform appropriate management actions;
- d) performance objectives and management actions that will enable maintenance and enhancement of *Clear Milkvine* and *Cryptic Forest Twiner* the offset and habitat covered by the plan;
- e) demonstration that any management actions to be undertaken will not adversely impact *EPBC species* (for example, this may apply to herbicide usage);
- f) a description of funding arrangements or agreements including work programs and responsible entities;
- g) an assessment of the baseline population and distribution for *Clear Milkvine* and *Cryptic Forest Twiner* within the offset, including:
  - i) the number of plants protected and their location;
  - ii) plant and habitat condition; and
  - iii) age classes.
- h) measures for regular monitoring of the status of individuals of *Clear Milkvine* and *Cryptic Forest Twiner* and their habitat as measured against the baseline population and distribution, including:
  - i) fluctuations in population size and distribution;
  - ii) life cycle patterns
  - iii) habitat requirements; and
  - iv) response to disturbances and/or management actions.
- i) Provision to revise the approved threatened flora offset management plan in response to the findings of research associated with condition 20(h).

The approved TFOMP must be implemented within seven days of its approval.

Action	Timing	Status	Compliance evidence
19.1 Prepare TFOMP addressing specified matters and other relevant matters	By 30 Jun 2015	Complete	Completed TFOMP
19.2 Provide TFOMP to Dept of the Environment for approval	By 30 Jun 2015	Complete (revised document was resubmitted to DoE on 7/11/2016) Plan approved 4/7/2017	Transmittal form (and any confirmation of receipt)

Action	Timing	Status	Compliance evidence
19.3 Implement TFOMP	Within 7 days of Minister's approval	Complete	Annual reporting

Action 19.1:

- GHD engaged and property surveys completed
- An area within Boambee State Forrest has been identified and Roads and Maritime are currently negotiating with State Forests regarding protection of this area in perpetuity as a Flora Reserve.
- Roads and Maritime wrote to DoE on 30/06/2015 requesting urgent consideration of the TFOS and seeking an extension of time to submit the TFOMP by 3 months, until 30/09/2015.

Action 19.2

- TFOMP was submitted to DoE on the 02/10/2015 for approval.
- Comments received from DoE on 30/11/2015.
- The revised document was resubmitted to DoE on 7/11/2016.
- TFOMP approved by DoE on 4 July 2017

Boambee State Forest (FCNSW) – FCNSW are currently completing their compensation assessment and are expected to have this to RMS shortly. Once compensation is paid, FCNSW will commence the gazettal process to declare the new Flora Reserve.

## Condition 20

Within three months from the date of this approval, the person taking the action must provide to the Minister, a strategy that details how, and when, the Norton Offset Site and Griffin Offset Site (as described in the referral documentation), will be legally secured in perpetuity by the person taking the action.

If the EPBC species habitat cleared as a result of the action is less than the impacts described in the referral documentation then any surplus biodiversity offset areas included in the offset management plans referred to in condition 19 and condition 21 could be secured as biodiversity offsets for other actions undertaken by the person taking the action and included in the offset strategies for those actions.

Action	Timing	Status	Compliance evidence
20.1 Prepare strategy to legally secure offset sites in perpetuity	By 26 Feb 2014	Complete	Both Norton and Griffin sites have been purchased by Roads and Maritime.
20.2 Provide strategy to Dept of the Environment	By 26 Feb 2014	Complete	Letter provided to Dept on 11-2-2014

## Condition 21

Within 12 months from the date of this approval, the *person taking the action* must provide to the *Minister* for approval, a plan for the management of the Norton Offset Site and Griffin Offset Site. The Norton and Griffin Offset Management Plan (NGOMP) must be targeted to the ecological requirements of the *Koala*, *Grey-headed Flying-fox*, *Spotted-tail Quoll*, *Regent honey eater* and *Swift Parrot* and build upon the ideas and concepts described in the *referral*. The plan must include, but need not be limited to:

- a) map(s) and *shapefiles* that clearly define the location and boundaries of the offset sites;
- b) details on the quality of the offset with reference to all *EPBC species* this plan is intended to protect;
- c) information about the *Koala*, *Grey-headed Flying-fox*, *Spotted-tail Quoll*, *Regent honey eater* and *Swift Parrot* (in relation to ecology, biology and conservation status) to inform appropriate management actions;
- d) the results of targeted field surveys within both offset sites (undertaken at any ecologically appropriate time of the year) to assess habitat suitability and presence / absence of individuals in relation to the *Koala*, *Grey-headed Flying-fox*, *Spotted-tail Quoll*, *Regent honey eater* and *Swift Parrot*;
- e) clear performance objectives and management actions that will enable maintenance and enhancement of habitat within the offset area, as well as contribute to the better protection of individuals and/or populations of *EPBC species* onsite;
- f) an assessment of the baseline population for *EPBC species* which are detected within the offset area during field surveys;
- g) demonstration that any management actions to be undertaken will not adversely impact *EPBC species* (for example, this may apply to pest control);
- h) a description of funding arrangements or agreements including work programs and responsible entities;
- i) details of a comprehensive long term monitoring program for determining the effectiveness of management actions;
- j) commitments to undertake contingency measures and corrective actions in the event that performance objectives are not met; and
- k) anticipated timeframes for achieving performance objectives.
- l) The approved Norton and Griffin offset management plan must be implemented within seven days of its approval.

Action	Timing	Status	Compliance evidence
21.1 Prepare NGOMP addressing specified matters and other relevant matters	By 26 Nov 2014	Complete	Completed NGOMP

Action	Timing	Status	Compliance evidence
21.2 Provide NGOMP to Dept of the Environment	By 26 Nov 2014	Completed - submitted to DoE on the 11/12/14  Re-submitted on the 23/12/16  Plan Approved 5/7/2017	Transmittal form (and any confirmation of receipt)
21.3 Implement NGOMP	Within 7 days of Minister's approval	Ongoing	Annual reporting

Note:

- It is assumed that satisfactory documentary evidence of implementation of the NGOMP would be provided through annual reporting.

Action 21.1:

- Prepare brief for tender (Complete)
- Tender assessment (Complete);
- Draft for Roads and Maritime review (Complete);
- Roads and Maritime review (Completed)

Action 21.2:

- Final - (Complete)
- Submitted to DoE for approval on the 11/12/14.
- Comments received from DoE on February 2016
- NGOMP re-submitted for approval on 23 December 2016.
- NGOMP approved by DoE on 5 July 2017

Action 21.3:

Contractor engaged and works completed by Roads and Maritime for the Property works as specified in the NGOMP for the demolition of the existing building, removal of rubbish including asbestos, and survey works for boundary fencing.

- Norton (RMS) and Swain (private) – BioBanking assessments have been completed and BioBanking applications are expected to be submitted to OEHL in February 2018.
- Griffin (RMS) – RMS are finalising the transfer details with NPWS and expect to have this completed by June 2018.
- Boambee SF (FCNSW) – FCNSW are currently completing their compensation assessment and should have this to RMS shortly. Once compensation is paid, FCNSW will commence the gazettal process to declare the new Flora Reserve.
- During 2017 RMS has undertaken routine inspections and property maintenance of the Norton and Griffin properties.

## Condition 22

Within one month after the commencement of *the action*, the *person taking the action* must advise *the Department* in writing of the actual date of commencement.

Action	Timing	Status	Compliance evidence
22.1 Provide written advice to Dept of the Environment of actual date of commencement	4 Jan 2014	Complete	Signed copy of letter on Roads & Maritime letterhead. Provided to Dept on 4-1-2014.

## Condition 23

The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement any management plans or reports required by this approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Department's website. The results of audits may also be publicised through the general media.

Action	Timing	Status	Compliance evidence
23.1 Quarterly review of the EPBC conditions compliance tracking program.	Quarterly	Ongoing	First review March 2014 Second review June 2014 Third Review September Forth Review October 2014. Fifth Review December 2014 Sixth Review February 2015 Seventh Review April 2015 Eighth Review June 2015 Ninth review August 2015 Tenth review October 2015 Eleventh review February 2016 Twelfth review May 2016 Thirteenth review July 2016 Fourteenth review December 2016
23.2 Provide records to Dept of the Environment as requested	As requested	TBA	Transmittal form (and any confirmation of receipt)

## Condition 24

Within three months of every one year anniversary of the commencement of *the action*, the *person taking the action* must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions. Documentary evidence providing proof of the date of publication and noncompliance with any of the conditions of this approval must be provided to *the Department* at the same time as the compliance report is published.

Action	Timing	Status	Compliance evidence
24.1 Prepare compliance report and upload to project website	By 4 Mar 2015	Complete	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.2 Prepare compliance report and upload to project website	By 4 Mar 2016	Complete	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.3 Prepare compliance report and upload to project website	By 4 Mar 2017	Complete	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.4 Prepare compliance report and upload to project website	By 4 Mar 2018	Complete	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.5 Prepare compliance report and upload to project website	By 4 Mar 2019	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.6 Prepare compliance report and upload to project website	By 4 Mar 2020	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.7 Prepare compliance report and upload to project website	By 4 Mar 2021	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.8 Prepare compliance report and upload to project website	By 4 Mar 2022	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any



<b>Action</b>	<b>Timing</b>	<b>Status</b>	<b>Compliance evidence</b>
			non-compliances.
24.9 Prepare compliance report and upload to project website	By 4 Mar 2023	Ongoing	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.10 Prepare compliance report and upload to project website	By 4 Mar 2024	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.11 Prepare compliance report and upload to project website	By 4 Mar 2025	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.12 Prepare compliance report and upload to project website	By 4 Mar 2026	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.13 Prepare compliance report and upload to project website	By 4 Mar 2027	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.14 Prepare compliance report and upload to project website	By 4 Mar 2028	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.15 Prepare compliance report and upload to project website	By 4 Mar 2029	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.
24.16 Prepare compliance report and upload to project website	By 4 Mar 2030	TBA	Report uploaded to project website. Advice provided to Dept on date of publication and any non-compliances.

## Condition 25

Upon the direction of *the Minister*, the *person taking the action* must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to *the Minister*. The independent auditor must be approved by *the Minister* prior to the commencement of the audit. Audit criteria must be agreed to by *the Minister* and the audit report must address the criteria to the satisfaction of *the Minister*.

Action	Timing	Status	Compliance evidence
25.1 Identify potentially suitable auditor(s)	On direction of the Minister	TBA	Tenderer(s) proposal(s) documenting expertise
25.2 Provide auditor's details to Dept of the Environment for approval	On direction of the Minister	TBA	Transmittal form (and any confirmation of receipt)
25.3 Auditor to develop audit criteria	Following receipt of Minister's approval	TBA	Completed audit criteria
25.4 Provide audit criteria to Dept of the Environment for approval	Following receipt of Minister's approval	TBA	Transmittal form (and any confirmation of receipt)
25.5 Conduct audit and document findings	Following receipt of Minister's approval	TBA	Completed audit report
25.6 Provide audit report to Dept of the Environment	At completion of audit	TBA	Transmittal form (and any confirmation of receipt)

- No independent audit of compliance has been requested from *the Minister* to date.

## Condition 26

If the *person taking the action* wishes to carry out any activity otherwise than in accordance with the TFOS, TFOMP, or NGOMP as specified in these conditions, the *person taking the action* must submit to *the Department for the Minister's* written approval a revised version of that TFOS, TFOMP, or NGOMP. The varied activity shall not commence until the Minister has approved the varied TFOS, TFOMP, or NGOMP in writing. *The Minister* will not approve a varied TFOS, TFOMP, or NGOMP unless the revised TFOS, TFOMP, or NGOMP will result in an equivalent or improved environmental outcome over time. If *the Minister* approves the TFOS, TFOMP, or NGOMP then that TFOS, TFOMP, or NGOMP must be implemented in place of the TFOS, TFOMP, or NGOMP originally approved.

Action	Timing	Status	Compliance evidence
26.1 Assess potential departure(s) from TFOS, TFOMP and/or NGOMP as relevant	As required	TBA	Consistency assessment
26.2 Revise TFOS, TFOMP and/or NGOMP as relevant	As required	TBA	Revised TFOS, TFOMP and/or NGOMP as relevant
26.3 Provide revised TFOS, TFOMP and/or NGOMP as relevant to Minister for approval	As required	TBA	Transmittal form (and any confirmation of receipt)
26.4 Implement revised TFOS, TFOMP and/or NGOMP as relevant in accordance with the Minister's written approval	Prior to any action that would not be consistent with the original approval or subsequent modified approval(s)	TBA	Annual reporting

## Condition 27

If *the Minister* believes that it is necessary or convenient for the better protection of listed threatened species and communities to do so, *the Minister* may request that the *person taking the action* make specified revisions to TFOS, TFOMP, or NGOMP specified in these conditions and submit the varied TFOS, TFOMP, or NGOMP for *the Minister's* written approval. The *person taking the action* must comply with any such request. The revised approved TFOS, TFOMP, or NGOMP must be implemented. Unless *the Minister* has approved the TFOS, TFOMP, or NGOMP, then the *person taking the action* must continue to implement the TFOS, TFOMP, or NGOMP originally approved, as specified in these conditions.

Action	Timing	Status	Compliance evidence
27.1 Revise TFOS, TFOMP and/or NGOMP as relevant as per directed by the Minister	As directed by the Minister	TBA	Completed revised TFOS, TFOMP and/or NGOMP as relevant
27.2 Provide revised TFOS, TFOMP and/or NGOMP as relevant to Dept of the Environment for approval	As directed by the Minister	TBA	Transmittal form (and any confirmation of receipt)
27.3 Implement revised TFOS, TFOMP and/or NGOMP as relevant in accordance with Minister's written approval	As directed by the Minister	TBA	Annual reporting

## Condition 28

If, at any time after five years from the date of this approval, the *person taking the action* has *not substantially commenced the action*, then the *person taking the action* must not *substantially commence the action* without the written agreement of *the Minister*.

Action	Timing	Status	Compliance evidence
28.1 Obtain written agreement of the Minister to substantially commence the project	As required after 25 Nov 2018	Complete	Minister's written agreement. Action substantially commenced on the 4 December 2013

## Condition 29

Unless otherwise agreed to in writing by *the Minister*, the *person taking the action* must publish all management plans and reports referred to in these conditions of approval on their website. Each management plan or report must be published on the website within 1 month of being approved, or where approval is not required, on the same day as the report is provided to *the Minister*.

### Note

Any plan, strategy or report that has been prepared as a requirement of a state legislation approval (in relation to *the action*) may be used to satisfy the requirements of any of the above conditions, providing the relevant criteria have been met (as specified in these conditions). Where the option is employed, the plan, strategy or report must be accompanied by a standalone document detailing where each of the relevant criteria have been addressed within that plan, strategy or report. This note is particularly relevant to conditions 13, 16, 17, 19, 21 and 25.

Action	Timing	Status	Compliance evidence
29.1 Upload approved NGOMP to project website (21)	Within 1 month of the Minister's approval	complete	NGOMP uploaded to project website
29.2 Upload approved TFOMP to project website (19)	Within 1 month of the Minister's approval	complete	TFOMP uploaded to project website
29.3 Upload fauna crossings, fencing and road medians outcomes report to project website (13)	1 year following construction completion	TBA	Report uploaded to project website
29.4 Upload translocation outcomes report to project website (16)	1 year following construction completion	complete	Report uploaded to project website
29.5 Upload updated fauna crossings, fencing and road medians outcomes report to project website (13)		TBA	Report uploaded to project website
29.6 Upload updated translocation outcomes report to project website (17)		TBA	Report uploaded to project website
29.7 Upload updated fauna crossings, fencing and road medians outcomes report to project website (13)		TBA	Report uploaded to project website
29.8 Upload updated translocation outcomes report to project website (17)		TBA	Report uploaded to project website
29.9 Upload updated fauna crossings, fencing and road		TBA	Report uploaded to project

Action	Timing	Status	Compliance evidence
medians outcomes report to project website (13)			website
29.10 Upload updated translocation outcomes report to project website (17)		TBA	Report uploaded to project website
29.11 Upload updated fauna crossings, fencing and road medians outcomes report to project website (13)		TBA	Report uploaded to project website
29.12 Upload updated translocation outcomes report to project website (17)		TBA	Report uploaded to project website
29.13 Upload compliance audit report to project website (25)	Same day as provided to the Minister	As required	Report uploaded to project website

Note:

- Number in parentheses under 'Action' refers to approval condition

Report Completion Register		
January 2016		
Report	Date Completed	Date Uploaded
TFOS	21/11/2014 (approved 19/7/2016)	18/8/2016
TFOMP	02/10/2015 and re-submitted on 7/11/16 (approved 5/4/2017)	3/8/2017
NGOMP	11/12/2014 and re-submitted on the 23/12/16 (approved 4/7/2017)	3/8/2017
Fauna crossings, fencing and road medians outcomes	February 2019	4 March 2019
Translocation outcomes report	Jan 2018--	4 March 2018--
Compliance audit report	--	--

## Attachment 1

# In Situ Flora Monitoring and Threatened Flora Translocation Monitoring Report



Pacific Highway Upgrade - Nambucca Heads to Urunga Operational Phase  
Threatened Flora Monitoring Year 1 Annual Report



Prepared for NSW Roads and Maritime Services  
Peter Richards  
December 2017

This report, **Pacific Highway Upgrade Nambucca Heads to Urunga Operational Phase - Threatened Flora Monitoring Year 1 Annual Report**, was prepared for NSW Roads and Maritime Services in accordance with the NSW *Environmental Planning and Assessment Act 1979*, the NSW *Threatened Species Conservation Act 1995* (now the NSW *Biodiversity Conservation Act 2016*) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The author of this report is Peter Richards, Consultant Ecologist, whose qualifications are B.Sc. (UNE).

Any opinion expressed in this report is the professional, objective opinion of the author.



December 2018

*Title Page Images*

Top: Slender Marsdenia *Marsdenia longiloba* in flower. Translocated plant in Sector A, Translocation Area 1.

Bottom: Red Bopple Nut *Hicksbeachia pinnatifolia* in flower. Translocated plant in Sector H, Translocation Area 1.

Images taken by Peter Richards, October - November 2017.

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**GLOSSARY**

<b>TERM</b>	<b>MEANING</b>
ANPC	Australian Network for Plant Conservation
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
<i>In-situ</i>	Latin term meaning 'in the original place'. In this report, refers to threatened plants that are being protected where they were found
LGA	Local Government Area
MCoA	Ministers Conditions of Approval
NH2U	Nambucca Heads to Urunga Pacific Highway Upgrade Project
NSW EPA	NSW Environment Protection Authority
NSW OEHS	NSW Office of Environment and Heritage
RMS	NSW Roads and Maritime Services
TA	Translocation Area
TFMP	Threatened Flora Management Plan (Ecos Environmental 2013)
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

## INTRODUCTION

The Nambucca Heads to Urunga Pacific Highway Upgrade Project (NH2U) is a 22-km-long section of the Pacific Highway upgrade on the Mid North Coast of NSW. The NH2U project comprises the northern half of the Warrell Creek to Urunga section of the Pacific Highway upgrade, which is being built in two stages. Mitigation measures employed during the construction of NH2U included *in-situ* protection, or translocation, and monitoring, of populations of the following eight threatened or rare plant species:

- Spider Orchid *Dendrobium melaleucaphilum* (Endangered, TSC/BC Act)
- Red Bopple Nut *Hicksbeachia pinnatifolia* (Vulnerable, TSC/BC Act & EPBC Act)
- Slender Marsdenia *Marsdenia longiloba* (Endangered, TSC/BC Act; Vulnerable, EPBC Act)
- Rusty Plum *Niemeyera whitei* (Vulnerable, TSC/BC Act)
- Woolfs's Tylophora *Tylophora woollsii* (Endangered, TSC/BC Act & EPBC Act).
- Koala Bells *Artanema fimbriatum* (unlisted, nationally rare)
- Gully Ironbark, Nambucca Ironbark *Eucalyptus ancophila* (unlisted, local endemic species)
- Ford's Goodenia *Goodenia fordiana* (unlisted, nationally rare)

### ***In-situ* flora populations**

One component of the mitigation measures employed on the NH2U project involved the protection and monitoring of *in situ* plants of Spider Orchid, Slender Marsdenia and Gully Ironbark that remain within the NH2U road reserve and were not directly impacted by the project. Baseline data collection, and construction phase monitoring, has been undertaken on 76 Spider Orchid plants, five Slender Marsdenia plants and a single Gully Ironbark (Ecos Environmental 2014, 2016, 2017) which are located at various points in the road reserve along the NH2U route (Figure 1).



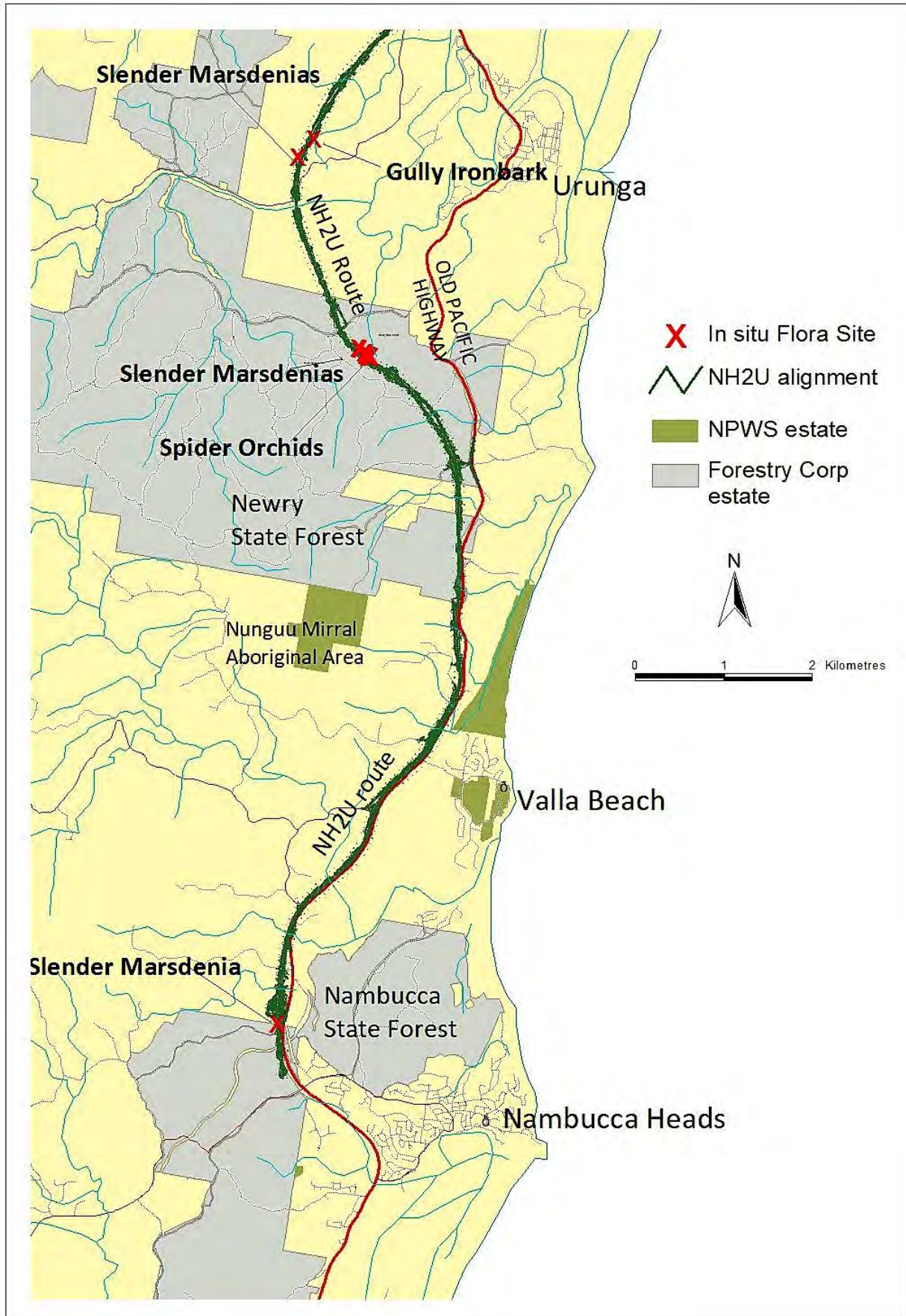


Figure 1: Location of NH2U in-situ threatened or rare flora monitoring sites.

## Translocated Flora Species

Where threatened or rare plants were recorded within the NH2U construction footprint and direct impact was unavoidable, a program was developed to guide the translocation and monitoring of Spider Orchid, Red Bopple Nut, Slender Marsdenia, Rusty Plum, Woolls's Tylophora, Koala Bells and Ford's Goodenia from the construction footprint into one of two recipient sites (Translocation Areas, TA1 and TA2) that adjoin the NH2U footprint and are owned and managed by RMS (Figure 2).

The translocations were conducted according to the Warrell Creek to Urunga Threatened Flora Management Plan (TFMP, Ecos Environmental 2013), which was prepared as a condition of approval by the NSW Department of Planning and the Commonwealth Department of Environment.

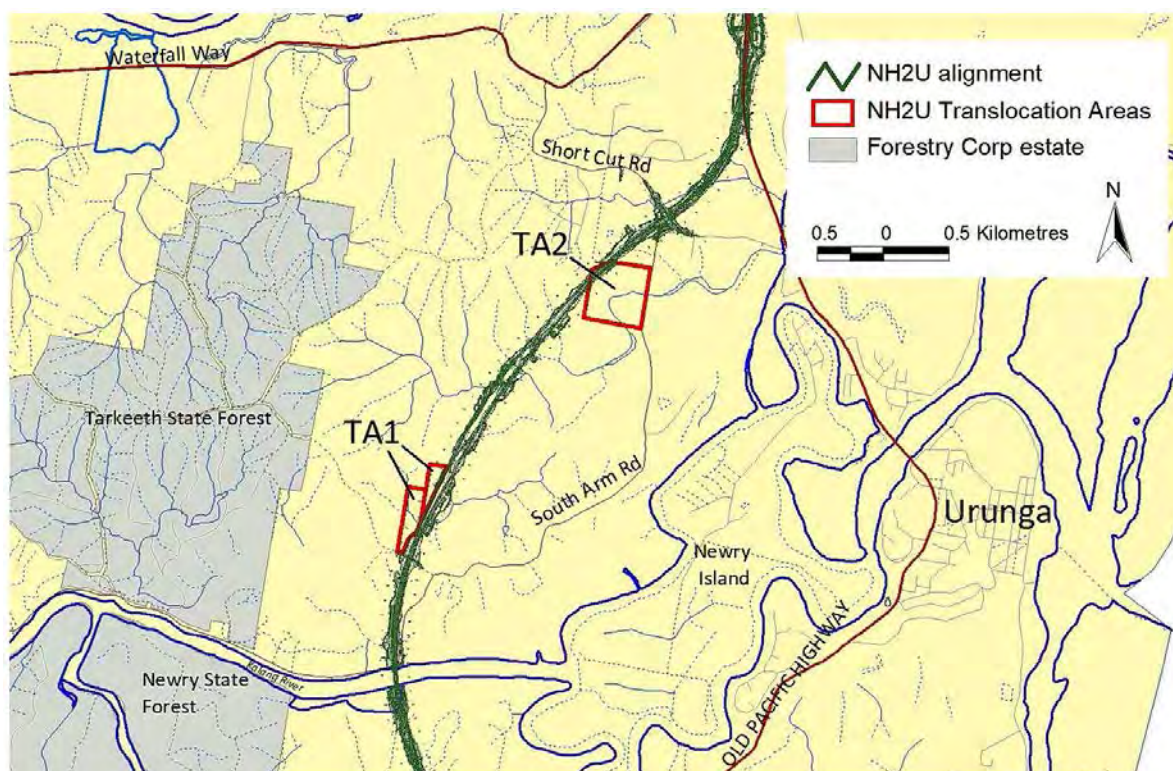


Figure 2: Location of NH2U Translocation Areas (TA1 and TA2).

## Translocation methods and planting layout

A thorough, detailed description of the actual salvage and translocation methodology is provided in Ecos Environmental (2013, 2014a, 2016a, 2016b). The summary provided below is also drawn from these Ecos Environmental reports, and explains the source of plant material (transplanted from construction footprint or propagated off-site), whether a slow-release fertiliser was applied, and the location within TA1 or TA2 of the transplants or enhancement plantings.

### Translocation Area 1

TA1 was divided into ten sectors (A to J, Figure 3) each receiving one species and different introduction treatments, as described below:

- Transplanted from construction footprint with no addition of fertiliser.
  - Sector A Slender Marsdenia
  - Sector B Woolls's Tylophora
- Transplanted from construction footprint with no fertiliser except initial watering with seaweed solution.
  - Sector C Ford's Goodenia



Sector D Koala Bells

Sector E Rusty Plum

- Propagated vegetatively and planted in experimental grids with and without addition of slow-release fertiliser.

Sector F Slender Marsdenia

Sector G Woolls's Tylophora

Sector I Woolls's Tylophora

- Propagated from seed and planted in an experimental grid with and without addition of slow-release fertiliser.

Sector J Slender Marsdenia

- Transplanted from construction footprint with no fertiliser except initial watering with seaweed solution.

Sector H Red Bopple Nut

*Translocation Area 2*

TA2 consists of two sectors, for the Spider Orchid and Koala Bells (Figure 4).

- Spider Orchid transplanted from construction footprint, no fertiliser addition – Sector A
- Koala Bells population enhancement, no fertiliser addition – Sector B

Individuals were planted at a regular spacing, with rows about 10m apart and individual plants about 5 metres apart along rows. Where a sector was on a hill slope, grid lines were laid out parallel with the slope contour. This facilitated comparison of species performance in relation to slope position.

Monitoring, to date, has been undertaken for a total of 681 translocated plants (Ecos Environmental 2014, 2016, 2016a) as detailed in Table 1 below.

*Table 1: Number and location of translocated plants and enhancement plantings at NH2U Translocation Areas.*

Translocation Area (TA)	Species	Sector / Method	Number of plants
TA1	Slender Marsdenia	Sector A – transplants	104
		Sector F – population enhancement (veg) & fertilizer experiment	90
		Sector J – population enhancement (seed) & fertilizer experiment	103
	Woolls's Tylophora	Sector B – transplants	42
		Sector G – population enhancement (veg) & fertilizer experiment	87
		Sector I – population enhancement (veg)	51
	Rusty Plum	Sector E – transplants and population enhancement (seed)	3 trees 40 seeds
	Red Bopple Nut	Sector H - transplant	1
	Koala Bells	Sector D - transplants	35
	Ford's Goodenia	Sector C – transplants	5 patches
TA2	Spider Orchid	Sector A - transplants	55
	Koala Bells	Sector B - population enhancement (veg)	69

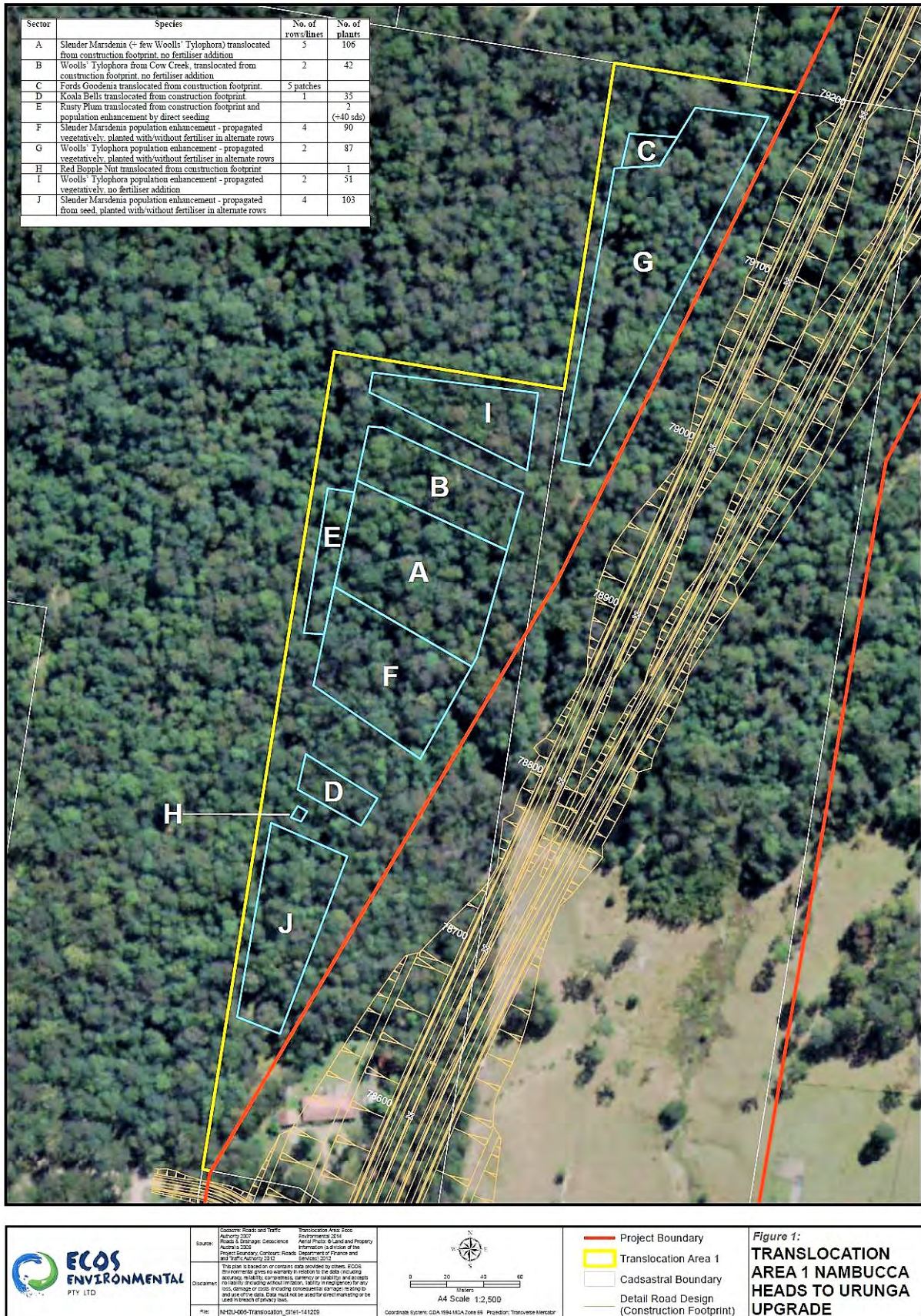


Figure 3: Translocation Area 1 (TA1) showing sectors supporting different species and treatments (from Ecos Environmental 2016a).



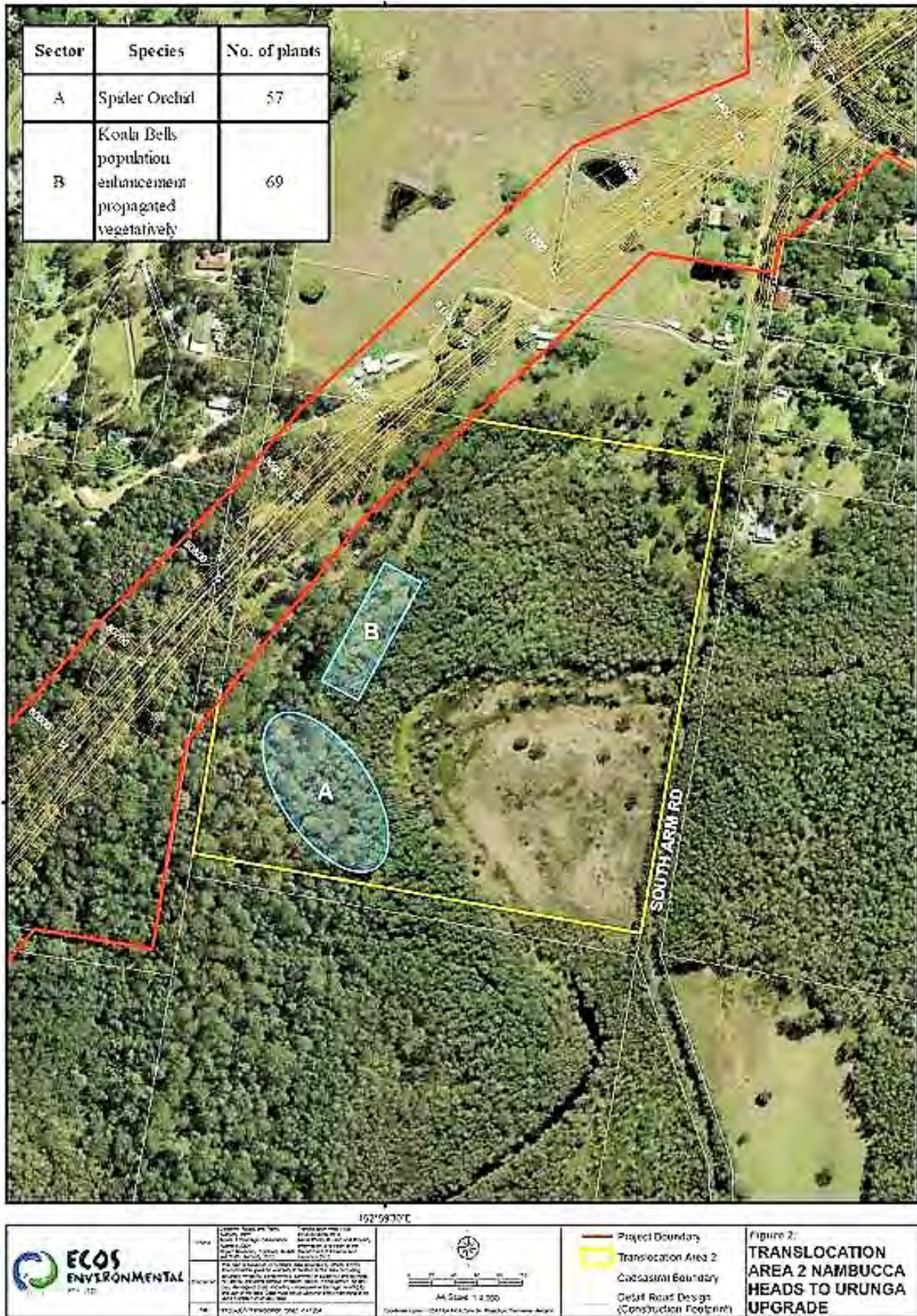


Figure 4: Translocation Area 2 (TA2) showing sectors supporting different species and treatments (from Ecos Environmental 2016a).

### *Objectives of translocation*

The objectives of the translocation project set out in the TFMP are:

- To salvage and re-establish impacted individuals of threatened (TSC/EPBC Act) species.
- To re-establish species at a recipient site near the original site with closely matching habitat and long-term security of tenure.
- To enhance the size and genetic diversity of the translocated population by propagation and introduction of individuals additional to those salvaged from the road footprint.
- To maintain good quality habitat to the relocation site(s).
- To preserve individuals of threatened species *in-situ* wherever possible and limit translocation to plants within the highway footprint and construction buffer.

In accordance with the Ministers' Conditions of Approval (MCoA) for the TFMP, an annual monitoring report is to be prepared which addresses the monitoring goals, provides an evaluation of the effectiveness of the mitigation measures against performance indicators, documents any corrective actions implemented, and identifies recommendations for any adaptive management.

Upon completion of the construction phase of the NH2U upgrade, responsibility for operational management passed to the NSW Roads and Maritime Services (RMS). This report describes the results of Year 1 (operational phase) monitoring of *in situ* and translocated flora for the NH2U upgrade. It should be noted that, upon completion of construction phase monitoring of translocated plants, monitoring of those species not listed as threatened under the TSC (BC) Act or the EPBC Act (Koala Bells and Ford's Goodenia) has been discontinued.

### **MONITORING METHODS**

Monitoring of all in-situ and translocated plants was undertaken over October and November 2017.

The following description of the NH2U flora monitoring methodology is adapted from Ecos Environmental (2014 to 2017). During the NH2U construction phase, monitoring of transplants was conducted every 3 months in Year 1, every 6 months in Year 2 and annually in Year 3. Population enhancement individuals were monitored twice in Year 1 thence at the same time as transplanted individuals. Ongoing monitoring during the NH2U operational phase is to be undertaken annually for a minimum five years.

Each transplanted and propagated plant was given a unique identification number which was written on flagging tape and attached to the plant itself, or to its protective wire cage. Transplants were re-located in the field using a hand-held GPS to navigate to a set of coordinates that had been recorded when the plants were introduced to the sites (in some cases coordinates were not available – in such cases a thorough search of the relevant sector was undertaken by the author, and each transplant found had locality coordinates recorded with a GPS unit). Data were recorded as per Section 3.8 of the TFMP, and listed in Table 2 below.

Table 2: Monitoring data recorded for each translocated species.

Data Recorded	Slender Marsdenia	Woolfs's Tylophora	Rusty Plum	Red Bopple Nut	Spider Orchid
Monitoring Number	y	y	y	y	y
Date	y	y	y	y	y
Line	y	y	-	-	-
Source Label	y	y	y	-	y
Translocation Label	y	y	y	y	y
Species - Current ID	y	y	-	-	-
Condition Class	y	y	y	y	y
No. leaves	y	y	-	-	
Height (cm)	y	y	y	y	
New Shoots – New Active Growth (Y/N)	y	y	y	y	y
Comment	y	y	y	y	y
No. of pseudobulbs with leaves	-	-	-	-	y
Length of the longest pseudobulb	-	-	-	-	y
Waypoint	y	y	y	y	y
Coordinates	y	y	y	y	y

### Condition Class Scores

The key attribute for evaluating species survival and performance was Condition Class, which was scored on a scale of 0 to 5. The scores were defined differently according to plant type, as detailed below in Table 3, Table 4 and Table 5.

Table 3: Condition scores applied to Slender Marsdenia and Woolfs's Tylophora.

Score	Condition
0	dead
1	stem died back to ground, no leaves or green stem, live stem stub may be present
2	plant < 75 cm tall; stem with leaves, with or without new shoots (active growth), or green leafless stem
3	plant > 75 cm tall, stem with leaves, with or without new shoots (active growth), if green leafless stem <1m or leaves discoloured score as 2
4	plant > 1.5m tall with > 15 leaves, mature or nearing maturity
5	plant flowering or seeding

Table 4: Condition scores applied to Rusty Plum and Red Bopple Nut.

Score	Condition
0	dead
1	leafless and no sign of re-shooting
2	pruned foliage retained, or small amount of re-shooting after defoliating, or foliage sparse/discoloured (<40 cm tall Koala Bells)
3	vigorous re-shooting (>40 cm tall Koala Bells)
4	crown recovering, foliage healthy
5	growing actively, flowering or seeding recorded



Table 5: Condition scores applied to Spider Orchid.

Score	Condition
0	dead
1	pseudobulbs discoloured/grazed/withering, no new growth
2	pseudobulbs healthy in colour, not withering, no new growth
3	plant small, not many healthy pseudobulbs, new growth occurring
4	several healthy pseudobulbs present, new growth occurring
5	several good sized, healthy pseudobulbs, flowering or seeding recorded

### Data Analysis

Monitoring data were stored and processed in Excel™ spreadsheets.

Species survival rate was calculated as:

$$(no. \text{ of individuals in condition classes } 2+3+4+5 / \text{total no. plants}) \times 100$$

Species 'thrival' rate (a term used by Ecos Environmental to describe the general trend in vigour of plants in individual sectors or subject to different treatments) was calculated as:

$$(number \text{ of individuals in condition classes } 3+4+5 / \text{total no. plants}) \times 100$$

The thrival rate provides, according to Ecos Environmental (2016a) a better indication of the percentage of plants likely to reach reproductive maturity. Mean plant species height was calculated for all plants including those with zero height (ie plants that had died back to the ground – condition class 1 - not just plants in condition classes 2 to 5).

## RESULTS - IN-SITU FLORA MONITORING

Appendix 1 provides full details of the results of the NH2U Year 1 October 2017 monitoring of all *in situ* flora. A summary of these results is provided below.

### Spider Orchid

The rate of survival of Spider Orchid decreased to 88% compared to the previous survey in February 2017. Several host plants could not be found, and some individual orchids had died, bringing the total number of losses or mortalities over four years to nine plants from the original 76. Some orchid plants bore old inflorescence axes, indicating that they had flowered earlier in the spring of 2017. No seed pods were recorded during the current survey.

Some of the attributes summarised in Table 6 below suggest a general decline in plant condition:

- Survival rate decreased, and
- Mean length of the longest pseudobulb per plant decreased.

However, other measured attributes (Table 6) indicate an improvement in plant condition:

- Mean number of pseudobulbs with leaves per plant increased.
- Percentage of plants showing an increase in number of pseudobulbs with leaves increased compared to last survey.
- The number of plants showing new shoot growth increased markedly.

This apparent anomaly in results may be due to two reasons. Firstly, because this is the author's first survey of the NH2U threatened flora sites, it is likely that plants that were not re-located during this survey are still present and alive, and may well be re-located next season. Secondly, the method employed to measure pseudobulb length may differ to that used by Ecos Environmental. It was

noticed that pseudobulb measurements taken during this current survey were generally shorter than those recorded by Ecos Environmental.

Considering the above factors, the overall trend in the *in-situ* Spider Orchid population indicates an improvement in plant condition, with a median condition class score of 3. This result is surprising, as the past year was characterised by long periods of below average rainfall, including a very severe winter-spring drought during which almost no rain was recorded between the end of June and the end of August 2017.

Table 6: Summary of monitoring results for *in-situ* Spider Orchids.

Attribute	Dec 2014	Feb 2016	Feb 2017	Oct 2017
No. plant points (host stems with orchids)	41	41	41	36
Total number of living orchid plants (n)	76	75	72	67
% survival	100%	98.7%	96.1%	88%
Median condition class of plants				3
Mean length of longest pseudobulb	5.27±0.86	6.46±0.85	5.92±0.34	4.2±4.1
Mean number of pseudobulbs with leaves per plant	2.46±0.43	2.92±0.19	2.46±0.19	3.4±1.8
% of plants with active new shoot growth	4.8%	15.2%	2.5%	60%
Change in number of pseudobulbs with leaves per plant relative to the year before (note – Oct 2017 result includes plants not found)		dead – 1%; decrease – 10%; increase – 59%; same – 29%	dead – 2.4%; decrease – 24.4%; increase – 24.4%; same – 48.7%	Dead / not found – 14%; decrease – 21%; increase – 41%; same – 24%

### Slender Marsdenia

Of the five *in-situ* Slender Marsdenia plants being monitored, two had died back, and the remaining sites supported relatively healthy plants, with a median condition class of 2. Sites UTW3 and UTW4 each had three plants recorded close to the flagged survey point. It is uncertain if all plants were present during past surveys, or if new plants have recruited into the sites, as only single plants had been previously recorded at these sites. Nonetheless, all plants were recorded as being in reasonable health (Figure 5).

Figure 5: *In-situ* Slender Marsdenia at site UTW4 in Oct 2017.





### Gully Ironbark

The very large Gully Ironbark, which occurs on a drainage line in the NH2U road reserve directly opposite TA1, was observed to be in good health, with new growth on some limbs. As this specimen is a very old tree, the crown inevitably displays some signs of senescence (Figure 6).



Figure 6: The very large, old Gully Ironbark opposite TA1. Note numerous old Yellow-bellied Glider feeding scars on the trunk.

### RESULTS - TRANSLOCATED FLORA MONITORING

Full details of the results of the current season's monitoring of all translocated threatened plants, including all data collected in the field, is provided as an Excel™ workbook which accompanies this report.



Ecos Environmental (2016a) reported the results of a comparison of the performance of fertilised *versus* non-fertilised Slender Marsdenia and Woolls's Tylophora transplants, and survival and mean plant height between transplants that had been planted along different contour lines in each sector (ie, a habitat preference trial). No significant difference in condition, height or survival between fertilised and non-fertilised plants was recorded, nor was any significant difference detected in the performance of transplants grown along different contour lines, from years 1 to 3. Considering these findings by Ecos Environmental, the fertiliser and habitat experiments will not be assessed or reported on in this and future monitoring reports, as 1) the fertiliser applied to plants would, by now, be depleted, and 2) results to date indicate that the transplants are located within habitat of uniform quality for the two subject vine species.

### Slender Marsdenia

Slender Marsdenia was planted in three sectors in TA1:

- Sector A - Directly transplanted from construction footprint with no fertiliser.
- Sector F - Propagated vegetatively and introduced with and without fertiliser.
- Sector J - Propagated from seed and introduced with and without fertiliser.

#### Sector A

Survival rate for all plants in Sector A was 40% after four years, a significant decrease on the previous year (69%) and probably attributable to the extremely dry winter-spring conditions of 2017. Mean plant height decreased slightly, but not significantly, from 39.9cm to 36.3cm. 62 plants had died back (58.5%), and two plants could not be found and have possibly been lost under tree-fall debris. These results are summarised in Table 7 below.

After four years the 'thrival rate' of Slender Marsdenia in Sector A was 21% (22 plants out of 106 with a Condition Class score of 3, 4 or 5), which compares favourably to previous results. 16 of these plants were more than one metre in height. Two plants, Nos. 30b and 54, were in flower at the time of survey (title page, top image). The percentage of plants with active shoot growth in October 2017 was 35%.

Table 7: Slender Marsdenia in TA1 Sector A - mean height in centimetres and percent survival of transplants.

All plants n = 106	Mar 2014	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	36.25	36.25	42.38	39.97	36.3
Survival %	90.5	87.6	71.2	67.9	40

#### Sector F

The survival rate of all plants in Sector F was 61.1%, a small decrease on the previous survey but significantly higher than the Sector A transplant survival rate. Mean plant height was 52.4cm, a small decrease on the previous survey (Table 8).

The thrival rate after 4 years was 33.3%, higher than the Sector A transplants and comparable to the Sector J seedlings (see below). 21 plants with a condition class score of 3 or more were more than one metre in height. No plants were in bud, or flowering, at the time of the current survey.

Table 8: Slender Marsdenia in TA1 Sector F - mean height in centimetres and percent survival of transplants.

All plants n = 90	Jul 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	21.04	68.50	55.89	52.44
Survival %	83.63	77.1	66.75	61.1

### Sector J

Propagated seedlings of Slender Marsdenia were planted in Sector J in August 2014. Previous monitoring reports described the faster early growth of seedlings compared to transplanted individuals (Ecos Environmental 2014a). Results from the current survey reveal a significant decrease in survival rate (from 82.5% to 54.39%) and mean plant height (64.19cm to 54.61cm) since the last monitoring survey (Table 9).

After 4 years the thrival rate of Slender Marsdenia in Sector J was 32.04%, about 50% better than the thrival rate of transplants in Sector A (21%). 28 of these plants were more than one metre in height and the tallest plant was 3 metres. No plants were in flower.

Table 9: Slender Marsdenia in TA1 Sector J - mean height in centimetres and percent survival of transplants.

All plants n = 103	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	46.75	69.15	64.19	54.61
Survival %	92.2	86.4	82.5	54.39

### Woolfs's Tylophora

The Tylophora from Cow Creek (tentatively identified by the National Herbarium of NSW as Woolfs's Tylophora *T. woolfsii*, and treated as such pending confirmation of identity) was translocated to TA1 into:

- Sector B - Directly transplanted from the construction footprint with no fertiliser.
- Sector G - Propagated vegetatively and introduced with and without fertiliser.
- Sector I - Propagated vegetatively and introduced without fertiliser.

### Sector B

Mean survival rate for all plants in Sector B for the current survey was 14.29% (6 plants of 42), a significant decrease from the previous year and showing a continuing trend of decline in condition of plants in this sector. Mean plant height also decreased significantly to 4.88cm (Table 10).

The strongest indicator of the poor state of plants in this sector is the current thrival rate of 0%. No plants were assessed as condition class 3 or better, down from 3 plants recorded as such during the previous survey. As suggested by Ecos Environmental (2016a), the recipient site is on a hill crest and is much drier and more exposed than other sectors. Numerous plants of Milky Silkpod *Parsonsia dorrigoensis*, a distantly-related vine species, were observed in Sector B, indicating different habitat conditions to those normally equated with the presence of Woolfs's Tylophora and Slender Marsdenia.

Table 10: Woolfs's Tylophora in TA1 Sector B - mean height in centimetres and percent survival of transplants.

All plants n = 42	Mar 2014	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	76.31	38.84	34.07	11.73	4.88
Survival %	90.5	80	73.8	31	14.29

### Sector G

Mean survival rate for all plants in Sector G was 26.1%, a significant decrease from the previous survey, and mirroring the decline recorded in plants in Sector B. Mean plant height also decreased to 18.81cm (Table 11). The better survival rate in this sector probably reflects the less exposed position of Sector G compared to Sector B.

Thrival rate was better in Sector G compared to Sector B, but still poor, with 12 plants (13.64%) in condition class 3 or better. Of those 12 plants, 4 were more than one metre high. All living plants with aerial stems in this sector were noted as looking very similar, in the author's opinion, to *Tylophora paniculata* rather than *T. woolfsii*.

Table 11: Woolls's *Tylophora* in TA1 Sector G - mean height in centimetres and percent survival of transplants.

All plants n = 88	Aug 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	49.98	43.04	32.6	18.81
Survival %	95.4	56.3	48.3	26.1

### Sector I

Mean survival rate for all plants in Sector I was 15.7%, a decrease from the previous survey, and following the trend of continual decline over time displayed by all Woolls's *Tylophora* transplants in TA1. Mean height also decreased to 12.94cm, down from 16.14cm recorded in the previous survey (Table 12).

Thrive rate for plants in Sector I was 9.8% (5 plants of 51, three of which were over a metre high). Again, all plants with aerial stems were noted during the current survey as looking more like *T. paniculata* than *T. woollsii*.

Table 12: Woolls's *Tylophora* in TA1 Sector I - mean height in centimetres and percent survival of transplants.

All plants n = 51	Dec 2014	Jan 2016	Nov 2016	Nov 2017
Mean height (cm)	70.41	36.68	16.14	12.94
Survival %	86.3	47.7	21.6	15.7

### Identity of *Tylophora* transplants in TA1

During this current monitoring program, the author corresponded with Dr Andrew Benwell of Ecos Environmental, who undertook the NH2U flora translocation project, designed and instigated the monitoring program, and wrote all the Ecos Environmental reports cited herein. Dr Benwell advised (pers. comm. Oct 2017) that he retained some material of the Cow Creek Woolls's *Tylophora* plants in pots. These plants had recently flowered and are in fact *Tylophora paniculata*, a reasonably common species which is not listed as rare or threatened. This finding confirms the author's field observations of the transplants in Sectors G and I.

This outcome means that ongoing monitoring of Sectors G and I is probably no longer warranted. Sector B, on the other hand, should continue to be monitored as the identity of transplanted vines there is not clear.

## Rusty Plum

### Translocated Rusty Plums

Two small Rusty Plum trees (4-8m high) were transplanted into Sector E in TA1. One tree had split and was separated into two pieces (plants 1 and 2) before planting. The other tree (plant 3) was pruned back to remove most of the branch system before being transplanted.

The current survey revealed a survival rate of 67%. Plant 1 bore a healthy, basal stem shoot which had doubled in size from the previous survey in November 2016. Plant 2 appeared to be dead, and Plant 3 was in excellent health with a flush of new growth (Figure 7).



Figure 7: Rusty Plum transplanted tree No. 3 in good health with new growth.

#### *Rusty Plum enhancement plantings*

Ecos Environmental (2016a) noted that most of the 40 Rusty Plum seeds planted directly into 20 points within Sector E of TA1 had germinated, but no protective wire cages were installed, resulting in heavy losses to browsing by wallabies and possums. Ten of the direct seeded points (50%) had live Rusty Plum seedlings in January 2016. This number had decreased to six (30%) by Nov 2016. During the current survey, only three points with Rusty Plum seedlings were recorded, a survival rate of 15%.

This decline in seedling numbers serves to highlight the importance of installing protective cages around seedlings. The author's experience with monitoring both direct-seeded and seedling Rusty Plums in a receival site as part of the Sapphire to Woolgoolga Pacific Highway Upgrade (Richards 2016) showed that, with protective cages in place, survival after 5 years was 51% and 65% respectively.

### Red Bopple Nut

A single Red Bopple Nut tree was transplanted to Sector H in TA1. The tree was recorded in excellent condition during the current survey. It bore numerous inflorescences (title page, bottom image), although no fruit-set was observed at the time of the survey.

### Spider Orchid

Six of the original Spider Orchid transplants were stolen from TA2 just after translocation had occurred, leaving 60 plants at the recipient site (Ecos Environmental 2016a). The rate of survival of transplanted Spider Orchids, based on the results of the current monitoring survey, indicates a decline to 78.3% survival, compared to previous survey results which reported over 90% survival (Table 13). This figure may underestimate actual survival, as 10 plants were not able to be re-located in October 2017. The recipient site was flooded after heavy rains when the current survey took place, making access difficult. It is therefore probable that some of the plants listed as missing will be re-located during the next survey.

Apart from the apparent decline in survival rate, other results showed an improvement in the population, including a small increase in the mean number of pseudobulbs with leaves per plant, and a significant jump in the number of plants bearing new shoots. Offsetting these increases, however, was a decline in mean length of the longest pseudobulb. As mentioned previously, in the results of the *in-situ* Spider Orchid monitoring, it appears that this may be due to differing methods of measuring pseudobulb length between report authors.

Median condition class of the translocated Spider Orchids was 2, which is the same as the previous survey. Several old inflorescence axes were observed during the current survey, but no evidence of fruit production was recorded.

Table 13: Summary of monitoring results for Spider Orchid transplants at TA2.

Attribute	Mar 2014	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean length of the longest pseudobulb (cm)	8.22	8.22	8.56	8.56	6.55
Mean number of pseudobulbs with leaves	1.95	1.73	2.40	2.40	2.43
Number of plants with new shoots (pseudobulbs)	1	6	10	10	15
Survival (%; n=60)	96.4	92.7	94.6	94.6	78.3

## DISCUSSION

In accordance with the MCoA of the NH2U TFMP (Ecos Environmental 2013), each annual monitoring report must include an assessment of the success or failure of protective measures for *in-situ* threatened flora, and an assessment of the success or failure of the threatened flora translocation program (salvage translocation and population enhancement measures). These assessments are provided below. The MCoA also requires a recommended work plan for the next 12 months. This, too, is provided below.

### Evaluation of *in-situ* Flora Management

The following performance indicators are used to evaluate the success of protective measures for *in-situ* threatened flora:



- a) The survival rate of *in-situ* threatened flora at the finish of clearing is 100%. No accidental damage occurs during clearing;
- b) The survival rate of *in-situ* threatened flora at the end of years 1-3 of the monitoring program is at least 80% and at least 70% at the end of years 4-8;
- c) Of plants surviving at the end of each year, at least 75% are in good condition – i.e. they have healthy foliage, no sign of die-back or disease and exhibit new shoot growth (Condition Class 3 or better).

Table 14 below summarises how the above performance indicators have been met to date.

Table 14: Evaluation of performance indicators for *in-situ* flora.

Species	100% survival rate at the finish of clearing. No accidental damage during clearing	80% survival rate at the end of years 1-3 and at least 70% at the end of years 4-8	At least 75% of surviving plants are in good condition at each year end (Condition Class 3 or higher)	Performance indicators met?
Spider Orchid	Y	Y (98.7% and 88%)	N (64%)	2 of 3
Slender Marsdenia	Y	Y (100% and 100%)	N (20%)	2 of 3
Gully Ironbark	Y	Y	Y	3 of 3

#### *Spider Orchid*

The current level of survival of *in-situ* Spider Orchids is the only performance indicator that has not been met to date. As noted previously, this may well be because not all surviving plants were located by the author during the current survey, as he is yet to become familiar with the sites and the location of all monitored plants. It is probable that surviving plants which were overlooked this season will be re-located in the next survey.

#### *Slender Marsdenia*

Note that in the above Table 14, a question mark precedes the survival rate for Slender Marsdenia in the current survey. This is because the aerial stems of plants that have been assigned a Condition Class of 1 have died back. These plants cannot be considered to have died, as a dormant but living subterranean rhizome usually persists. Slender Marsdenia generally displays a seasonal growth pattern of stem dieback and resprouting, with stems dying back in response to the winter-spring drought experienced in this region. Resprouting may occur annually or it may not occur for several years, after which a new shoot can arise from the dormant stem base or rhizome. Taking this characteristic into account, survival of *in-situ* Slender Marsdenia plants to date is 100%. However, general condition class is low, possibly because of the severe drought over winter and spring of 2017.

### Evaluation of Flora Translocation Program

The following performance indicators are used to evaluate the success of the threatened species translocations (salvage translocation and population enhancement):

- a) All directly impacted individuals of threatened species were salvaged and relocated to the receival sites.
- b) At least 60% of transplant and enhancement individuals are surviving after the first year, 50% after five years and 40% after eight years.
- c) At the end of the monitoring program (8 years), at least 50% of surviving individuals have a Condition Class of 3 or higher.

Table 15 below summarises how the above performance indicators have been met to date.

Table 15: Evaluation of performance indicators for translocated flora.

Species	All directly impacted individuals of threatened species were salvaged and relocated to the receival site(s).	At least 60% of transplant and enhancement individuals are surviving after the first year, 50% after five years and 40% after eight years	At the end of the monitoring program (8 years), at least 50% of surviving individuals have a Condition Class of 3 or higher.	Performance indicators met?
Slender Marsdenia	Y	Y, n/a, n/a	n/a	2 of 3 to date
Woolfs's Tylophora	Y	Y, n/a, n/a	n/a	2 of 3 to date
Rusty Plum	Y	Y, n/a, n/a	n/a	2 of 3 to date
Red Bopple Nut	Y	Y, n/a, n/a	n/a	2 of 3 to date
Spider Orchid	Y	Y, n/a, n/a	n/a	2 of 3 to date

It is clear from Table 15 above that the performance indicators are designed to provide an assessment of translocation success mainly for the latter half of the program (years 5 to 8). Because of this, little can be gleaned from this current assessment, apart from some specific comments below.

#### *Slender Marsdenia*

The current (Year 4) mean survival rate of all Slender Marsdenia plants stands at 51.8%. Based on the author's knowledge of other translocations of this species, this is a comparatively good result. However, successful achievement of the performance indicators for this species is most likely as dependant on climatic factors as much as anything else. Should the region experience a severe winter-spring drought like the 2017 episode, then the survival rate of Slender Marsdenia transplants would be expected to decline as more plants die back in response to dry conditions. On the other hand, should milder conditions prevail then significantly more Slender Marsdenia plants might be expected to produce aerial shoots and be in better overall condition.

#### *Woolfs's Tylophora*

The current (Year 4) mean survival rate of all Woolfs's Tylophora (now known to be mostly *T. paniculata*) stands at 18.7%, with a correspondingly low median condition class score of 1. If this low survival and condition persists, then the translocation of this species will have failed all survival and condition class performance indicators. It is of interest to note the poor translocation performance of what has turned out to be a quite common species.

#### *Rusty Plum*

Because all Rusty Plum transplants and half the Rusty Plum enhancement plantings survived through Year 1, at present Rusty Plum meets relevant performance criteria. As at Year 4, Rusty Plum transplant survival is 67%, which, if maintained, will meet ongoing performance criteria. However, the enhancement planting survival rate is currently only 15%, which equates to failure of performance criteria for Year 5, should these rates continue. This failure in performance of Rusty Plum is largely due to easily preventable browsing of enhancement plantings by wildlife. Replenishing the enhancement plantings via direct seeding and installation of tree protectors would most likely reinstate the success of the Rusty Plum plantings.

#### *Spider Orchid*

The current (Year 4) survival rate of 78.3% is probably an underestimate of the actual rate of survival of Spider Orchid plants at TA2, as explained above. Overall, the translocation of Spider Orchid plants has been successful, and it is expected that performance indicators will be met in the future for this species.

## RECOMMENDED 12 MONTH WORK PLAN.

The following actions are recommended here with the aim of achieving the principle objectives and performance indicators of the TFMP for *in-situ* and translocated flora.

1. Discontinue monitoring of *Tylophora paniculata* plants in Sectors G and I in TA1.
2. Direct seed additional Rusty Plum seeds to replace those lost through browsing by wildlife. It is recommended that an additional 40 Rusty Plum seeds be direct-seeded into Sector E in TA1. The heavy mortality reported for Rusty Plum enhancement plantings should be rectified to ensure that performance indicators for this species are met in the future.
3. Install protective cages on all new and surviving Rusty Plum enhancement plantings. Robust, plastic mesh tree guards, 1 metre high and about 50cm wide, were installed on Rusty Plum seedlings at a translocation site for the Sapphire to Woolgoolga Highway Upgrade (Richards 2016). These guards had an immediately beneficial effect on the seedlings, with immediate cessation of browsing and a corresponding improvement in plant condition.

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- ECOS Environmental Pty Ltd. 2017. Nambucca Heads to Urunga Pacific Highway Upgrade - Monitoring of In-situ Roadside Threatened Plants - Year 3 (December 2014 to February 2017) Results
- Richards, P. 2016. Pacific Highway Sapphire to Woolgoolga Upgrade Threatened Flora Monitoring Annual Report 5. Final report prepared for NSW Roads and Maritime Services.



**APPENDIX 1: Monitoring Results – all *in situ* flora March 2017****Spider Orchid**

Monitoring No.	Date	Number of plants	Condition Class	Number of pseudobulbs	No. of pseudobulbs with leaves	No. of pseudobulbs with leaves previous survey	Length of the longest pseudobulb overall (cm)	New growth	Comment	pb change Feb 2017 to Oct 2017
so-59	16/10/2017	1	1	3	1	1	1	n	On Grey Gum sapling. Will vanish when bark shed.	same
so-61	16/10/2017	2	2	8	1	1	1.5	n		same
	16/10/2017		2	4	1	1	1	n		same
A	16/10/2017	0	0			2		o	Not found	-
so-39	16/10/2017	2	1	4	0	4	10	n	Both look dead, but pb still green on L plant	decrease
	16/10/2017		1	3	0	4	3	n		decrease
so-41	16/10/2017	4	3	8	4	3	19	y	Top of host stem with 2 plants on it has broken off	increase
	16/10/2017		3	9	4	3	16	y		increase
	16/10/2017		3	4	2	2	1.5	n		same
	16/10/2017		3	8	6	4	2.5	n		increase
so-40	16/10/2017	2	3	14	11	10	6.5	y	3 plants present, lowest 2 monitored	increase
	16/10/2017		3	8	7	6	3	y		increase
so-69	16/10/2017	3	3	6	4	2	2.5	y		increase
	16/10/2017		3	9	3	2	4	y		increase
	16/10/2017		3	6	5	2	1.5	y		increase
so-70	16/10/2017	1	1	8	1	2	2	y		decrease
B	16/10/2017	2	3	9	4	3	2.5	y		increase
	16/10/2017		3	5	3	3	1.5	y		same
C	16/10/2017	1	2	5	3	1	1.5	n		increase
D	16/10/2017	0	0			0		o	dead	-
so-71	16/10/2017	4	0					o	dead	-
	16/10/2017		1	2	2	1	1	y		decrease
	16/10/2017		1	2	2	1	1	y		decrease
	16/10/2017		1	3	2	1	1	y		decrease

Monitoring No.	Date	Number of plants	Condition Class	Number of pseudobulbs	No. of pseudobulbs with leaves	No. of pseudobulbs with leaves previous survey	Length of the longest pseudobulb overall (cm)	New growth	Comment	pb change Feb 2017 to Oct 2017
<b>so-72</b>	16/10/2017	6	2	5 (largest)	4	3	4.5	n		increase
	16/10/2017		2					n		-
	16/10/2017		1					n		-
	16/10/2017		2					n		-
	16/10/2017		2					n		-
	16/10/2017		3					y		-
<b>F</b>	16/10/2017	3	3	10	3	3	4.5	y		same
	16/10/2017		3	5	3	4	5	n		decrease
	16/10/2017		3	4	4	4	19	n		same
<b>G</b>	16/10/2017	1	3	5	2	2	1.5	y		same
<b>H</b>	16/10/2017	2	2	4	1	5	1.5	y		decrease
	16/10/2017		3	8	2	2	5	n		same
<b>M</b>	16/10/2017	0	0					o	not found	-
<b>N</b>	16/10/2017	1	3	5	4	3	4	y	host tree has snapped below orchid	increase
<b>so-27</b>	16/10/2017	3	2	7	3	1	2	y		increase
	16/10/2017		2	8	6	1	1	y		increase
	16/10/2017		2	4	2	4	1	y		decrease
<b>so-26</b>	16/10/2017	1	3	6	5	4	2.5	y	3 plants on tree	increase
<b>so-22</b>	16/10/2017	1	2	14	8	6	1	y	many tiny Pbs at base with leaves	increase
<b>O</b>	16/10/2017	2	3	5	5	3	1	y	1 plant either side of flagging. 1 more plant further up.	increase
	16/10/2017		3	6	6	5	6	y		increase
<b>P</b>	16/10/2017	1	3	5	4	2	2	y	1 other plant high up on tree	increase
<b>Q</b>	16/10/2017	1	3	8	6	7	1.5	y		decrease
<b>so-21</b>	16/10/2017	1	3	8	1	4	8	y	One new Pb, but in poor health	decrease
<b>R</b>	16/10/2017	2	2	5	5	4	2	n	Both plants just hanging on by roots to loose bark	increase
	16/10/2017		2	4	3	3	3	n		same
<b>so-19</b>	16/10/2017	0	0					o	not found	-
<b>so-17</b>	16/10/2017	0	0					o	not found	-
<b>so-16</b>	16/10/2017	1	2	3	2	3	4	n	On broken stem	decrease
<b>so-15</b>	16/10/2017	3	3	5	1	4	1	y		decrease

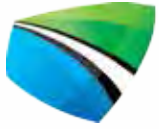
Monitoring No.	Date	Number of plants	Condition Class	Number of pseudobulbs	No. of pseudobulbs with leaves	No. of pseudobulbs with leaves previous survey	Length of the longest pseudobulb overall (cm)	New growth	Comment	pb change Feb 2017 to Oct 2017
	16/10/2017		3	5	3	3	2.5	n		same
	16/10/2017		2	6	5	2	1	n		increase
<b>S</b>	16/10/2017	3	3	7	3	3	3	n		same
	16/10/2017		2	4	3	3	1	n		same
	16/10/2017		3	5	4	3	1.5	n		increase
<b>so-14</b>	16/10/2017	1	3	7	3	2,2	5	y	One plant gone. Top of host stem snapped off.	increase
<b>so-12</b>	16/10/2017	2	3	4	4	2	1	y		increase
	16/10/2017		1	6	0	5	1	y		decrease
<b>so-10</b>	16/10/2017	1	3	9	5	3	3	y		increase
<b>so-11</b>	16/10/2017	2	3	5	4	4	3	y		same
	16/10/2017		3		5	5	3	y		same
<b>so-6</b>	16/10/2017	2	3	3	3	2	1.5	y		increase
	16/10/2017		3	5	3	3	5	y		same
<b>so-5</b>	16/10/2017	1	3	8	3	1	3	y		increase
<b>so-4</b>	16/10/2017	1	3	6	3	5	1.5	y		decrease
<b>so-7</b>	16/10/2017	2	3	4	3	2	1.5	y		increase
	16/10/2017		3	6	3	1	1.5	y		increase
<b>so-8</b>	16/10/2017	3	3	7	2	5	2	y		decrease
	16/10/2017		3	7	4	4	3	y		same
	16/10/2017		3	6	3	3	2	y		same
<b>so-9</b>	16/10/2017	2	3	7	3	1	1	y	tiny plants	increase
	16/10/2017		2	3	2	1	1	y		increase

Note: where more than one plant occurs, the lowest plant is recorded first and the highest plant last. If score is the same for all plants, then only one score is recorded. Some scores are given only for the largest of multiple plants.

**Slender Marsdenia and Gully Ironbark**

Label	Species	Chainage	Date	Condition Class	Height (m)	New shoots	Comment
<b>ML 119</b>	Slender Marsdenia	62100	11/10/2017	1			Died back. Only dead stems found along barbed wire fence.
<b>ML 2010-1</b>	Slender Marsdenia	75000	11/10/2017	2	0.4	Y	Plant 1m downhill from flagged shrub. Good health.
<b>ML 2010-3</b>	Slender Marsdenia	75000	11/10/2017	1			Died back.
<b>UTW3</b>	Slender Marsdenia	78450	11/10/2017	2	.2; .8; .1	Y; N; N	3 plants in an uphill to downhill line. All scrambling in litter
<b>UTW4</b>	Slender Marsdenia	78450	11/10/2017	3	.8; .7; .1	Y; Y; N	
<b>EA</b>	Gully Ironbark	78850	11/10/2017	3		Y	OK

Attachment 2  
Condition two compliance report



Roads &  
Maritime

# **Commonwealth approval EPBC 2013/6963 Condition Two Compliance**

## **Nambucca Heads to Urunga Pacific Highway Upgrade**

January 2018



# Contents

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# Attachments

**Attachment 1**      Nambucca heads to Urunga EPBC habitat WAE Clearing Maps

## Glossary / Abbreviations

Acronyms used in this document

<b>Acronym</b>	<b>Definition</b>
BEM	Benchmark Environmental Management
CAR	Corrective Action Request
CEMP	Construction Environmental Management Plan
Clear Milkvine	Marsdenia longiloba
Cryptic Forest Twiner	Tylophora Woollsii
Ecos	Ecos Environmental Pty Ltd
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ER	Environmental Representative - A suitably qualified and experienced person independent of project design and construction personnel employed for the duration of construction. The principal point of advice in relation to all questions and complaints concerning environmental performance.
NCR	Non Conformance Report
NH2U	Nambucca Heads to Urunga
NGOMP	Norton and Griffin Offset Management Plan
SAP	Sensitive Area Plan
SES	Sandpiper Ecological Surveys
TFOMP	Threatened Flora Offset Management Plan
TFMP	Threatened Flora Management Plan
TFOS	Threatened Flora Offset Strategy

# Introduction

## Purpose of this document

The purpose of this document is to facilitate demonstration by Roads and Maritime Services (Roads & Maritime) of satisfactory compliance with the Commonwealth approval conditions for the Nambucca Heads to Urunga Pacific Highway Upgrade project with particular reference to Condition 2. This requires a report that clearly shows the location of all vegetation and EPBC species habitat cleared as a result of the action, and that demonstrates compliance with the condition.

### Condition 2

Within 30 days of the completion of *construction* works, the person taking action must:

- a) notify the Minister in writing of the completion of construction; and
- b) provide a report (supported by appropriate mapping) that clearly shows the location of all vegetation and EPBC species habitat cleared as a result of the action, and that demonstrates compliance with Condition 1.

## Discussion

EPBC 2013/6963 Condition one states:

*The person taking the action must not clear more than:*

- 171 ha of Koala habitat;
- 184 ha of Grey-headed Flying-fox habitat;
- 166 ha of Spotted-tail Quoll habitat;
- 73 ha of habitat for the Swift Parrot and Regent Honeyeater; and
- 36 ha of habitat for the Cryptic Forest Twiner and Clear Milkvine.

To facilitate compliance with condition one, the NH2U design was overlaid against the vegetation types that make up the five different habitat types listed above to determine the total clearing quantity for the project.

Throughout the progression of the design, all the way through to completion of clearing, the total clearing was compared against the EPBC 2013/6963 clearing limits to ensure the design was compliant with the approval.

The clearing quantities were tracked through the project through the quarterly compliance tracking meetings and the EPBC annual reports submitted to DoE. Throughout the project, clearing quantities were identified to be below those specified in condition one. *Table 1 below* displays the final clearing quantities for the NH2U Project.

Table 1: Final Clearing Quantities

Final Clearing Quantities (EN1 FDD + Additions)			
Habitat Type	Final Clearing Quantity (ha)	Limit (ha) as per Condition 1 Approval	Difference showing remaining habitat (ha) under Condition 1 Approval
Koala	157.89	171	13.11
Grey-headed Flying-fox	170.84	184	13.16
Spotted –tail Quoll habitat	71.40	166	94.60
Swift Parrot and Regent Honeyeater	71.40	73	1.60
Cryptic Forest Twiner and Clear Milkvine	34.11	36	1.89

Mainline clearing was completed during 2014. A small amount of clearing was undertaken throughout 2015 and 2016.

## Mapping

Condition 2 calls for appropriate mapping to be provided that supports the final clearing quantities as displayed in Table 1. **Attachment 1** shows the final design with the Work as Executed (WAE) clearing boundary. Overlaid with this is the vegetation types that make up the above habitats.

## Conclusion

The project, since inception has been committed to reducing the extent of native vegetation clearing to only that specifically required to successfully complete the highway upgrade. Through consistent tracking of the clearing activities, and as shown in the attached mapping, all final clearing quantities for each habitat type are compliant with the limits as specified in Condition One.

## Attachment 1











### Nambucca heads to Urunga EPBC habitat WAE Clearing Maps

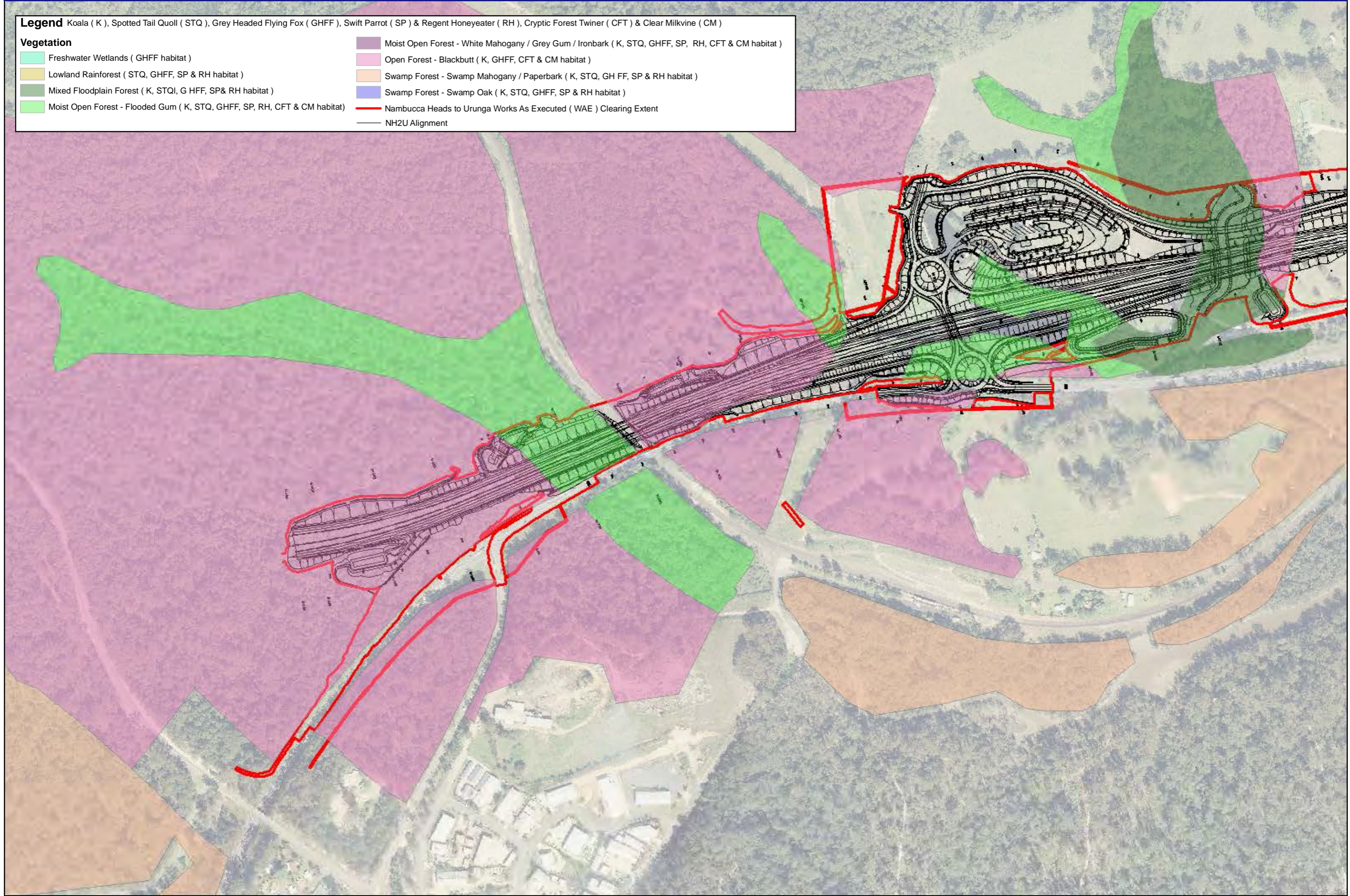


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 1

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













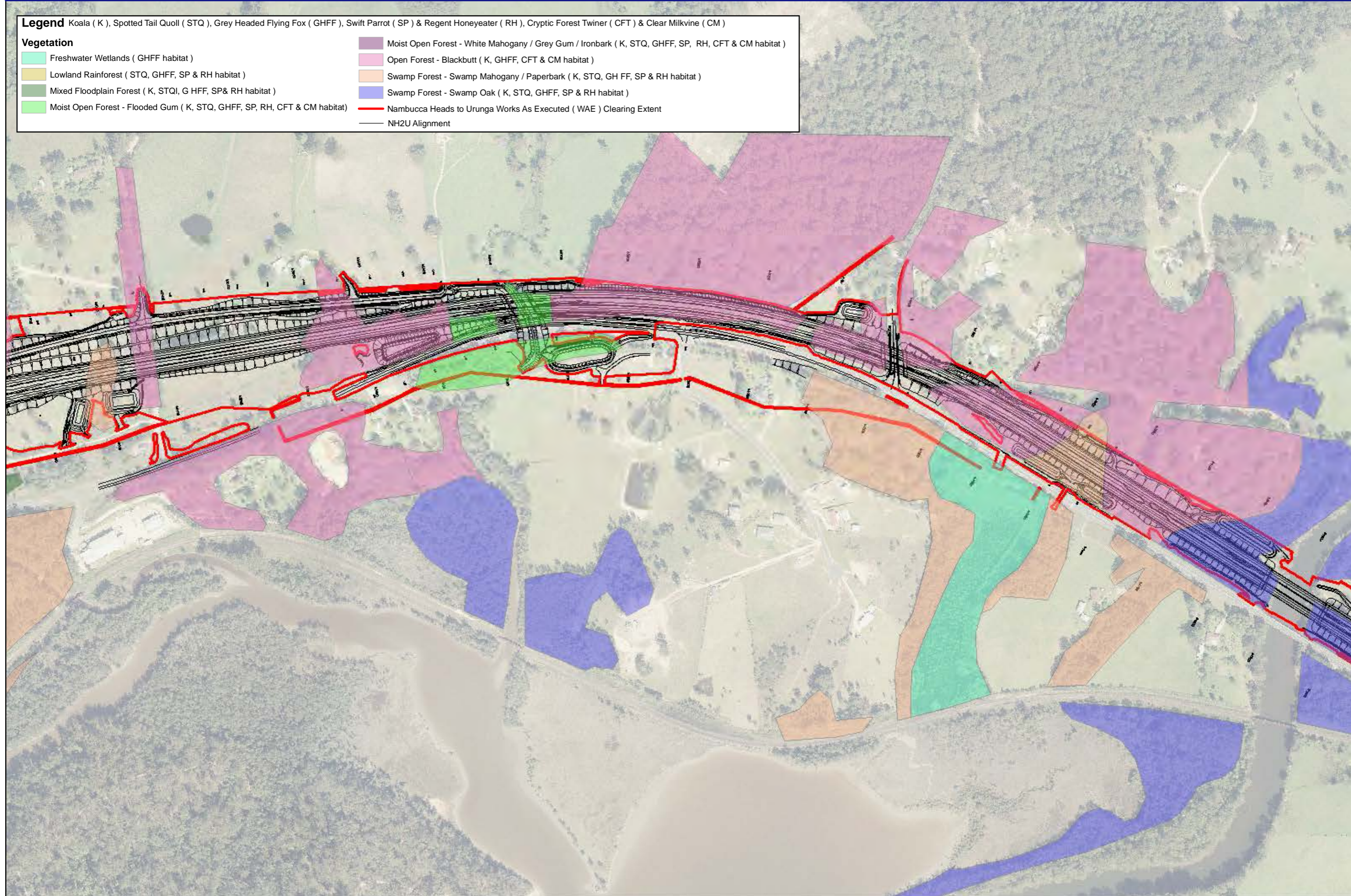


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 2

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













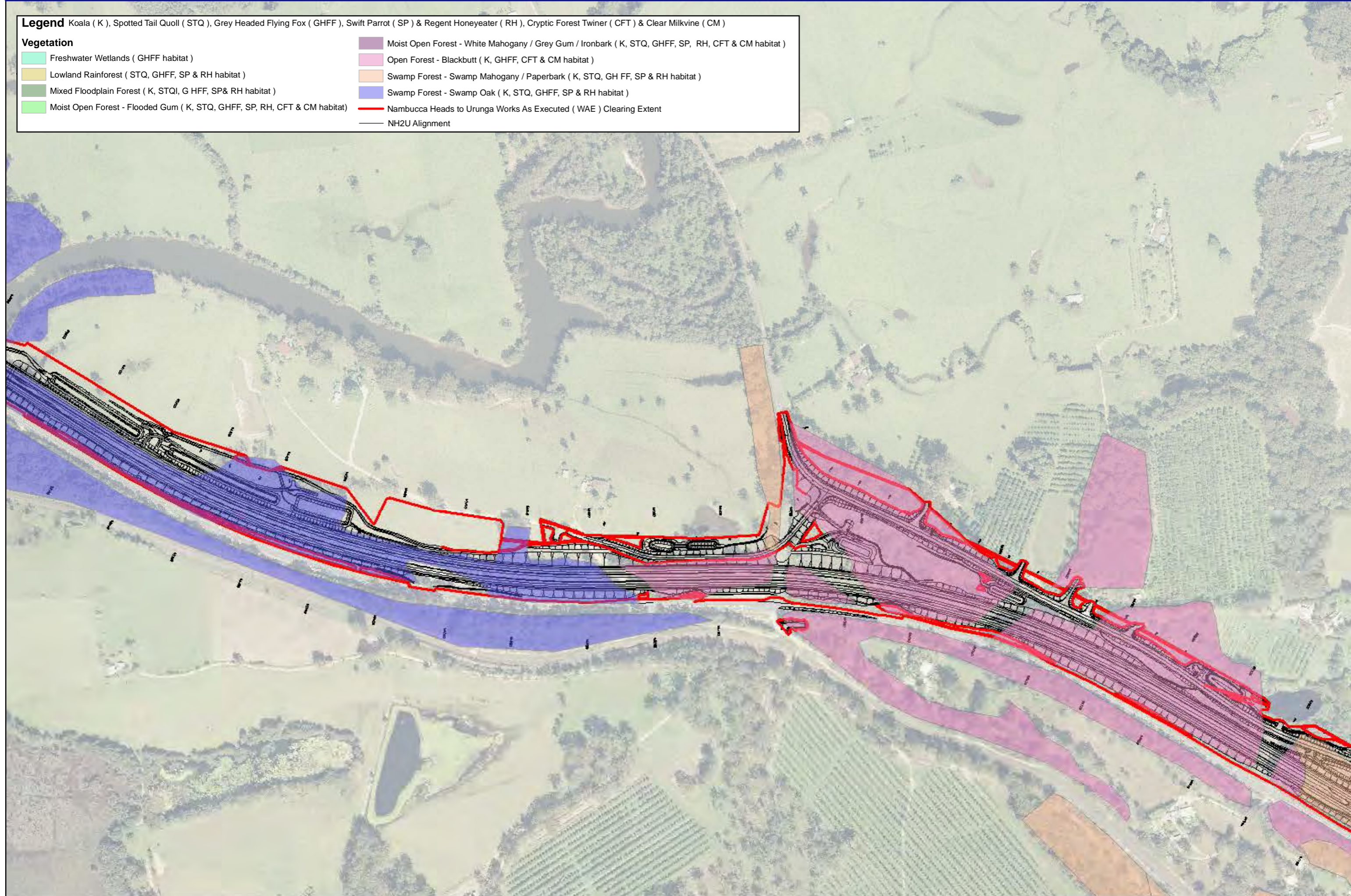


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 3

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













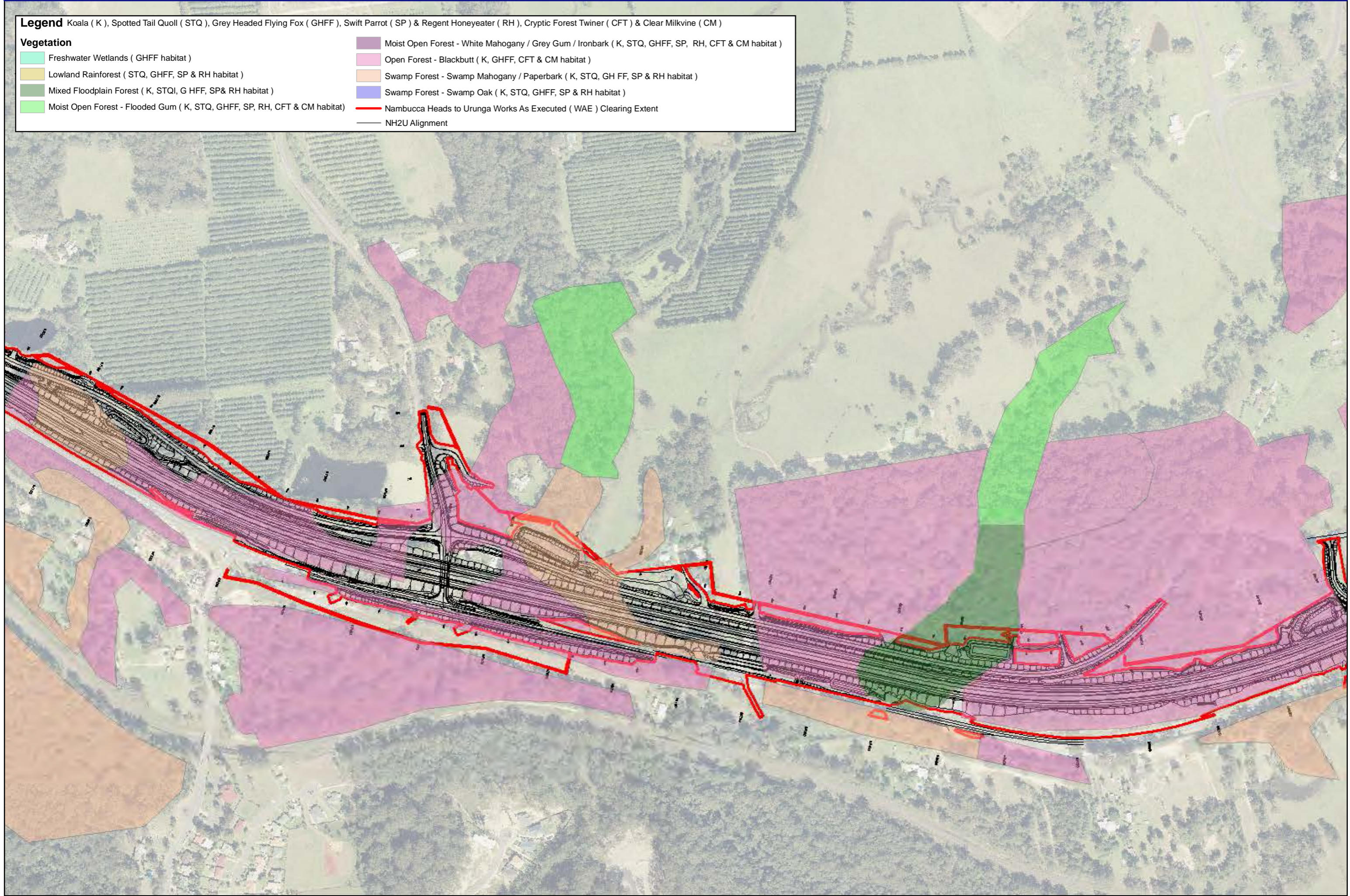


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 4

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













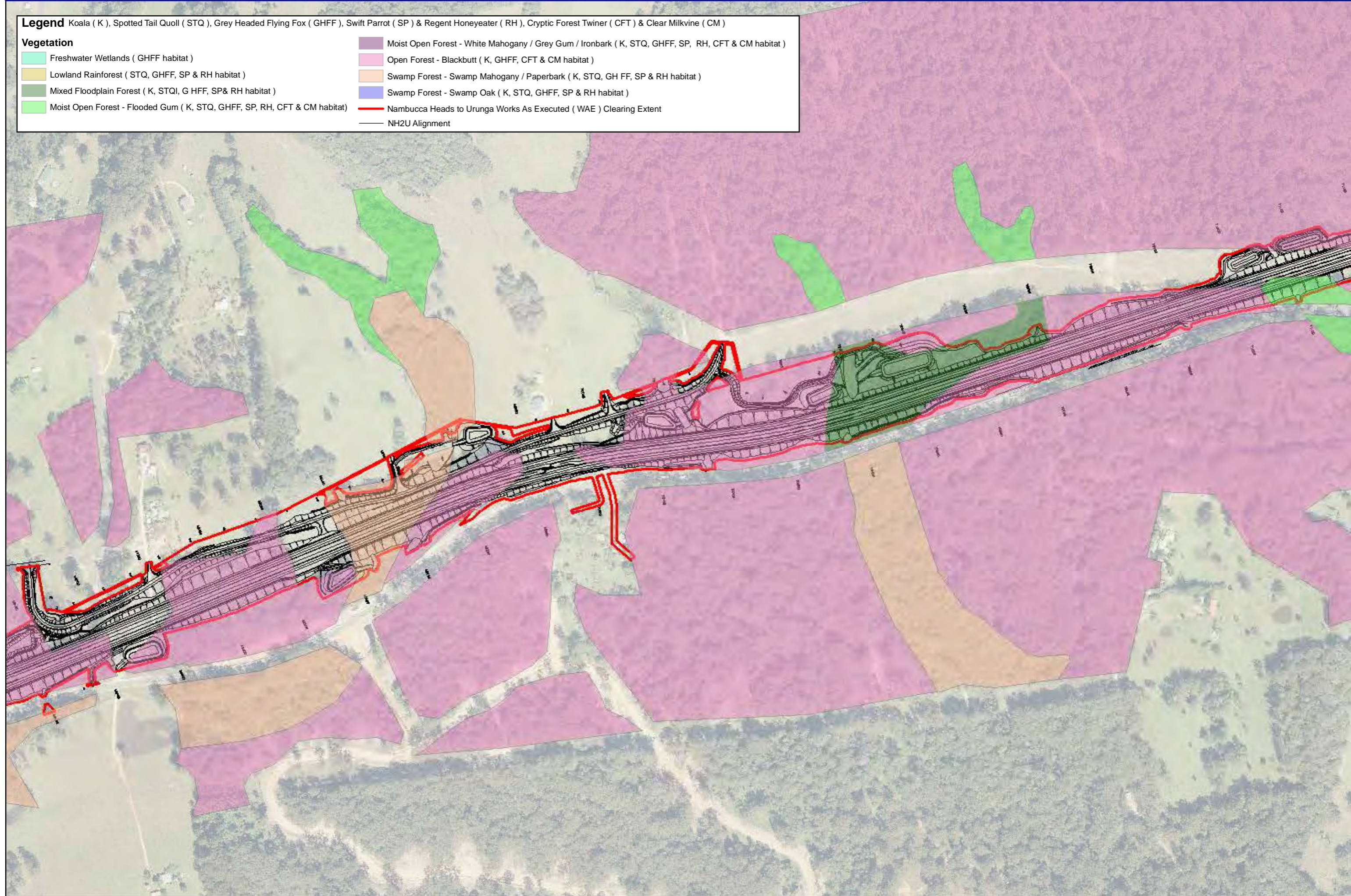


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 5

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













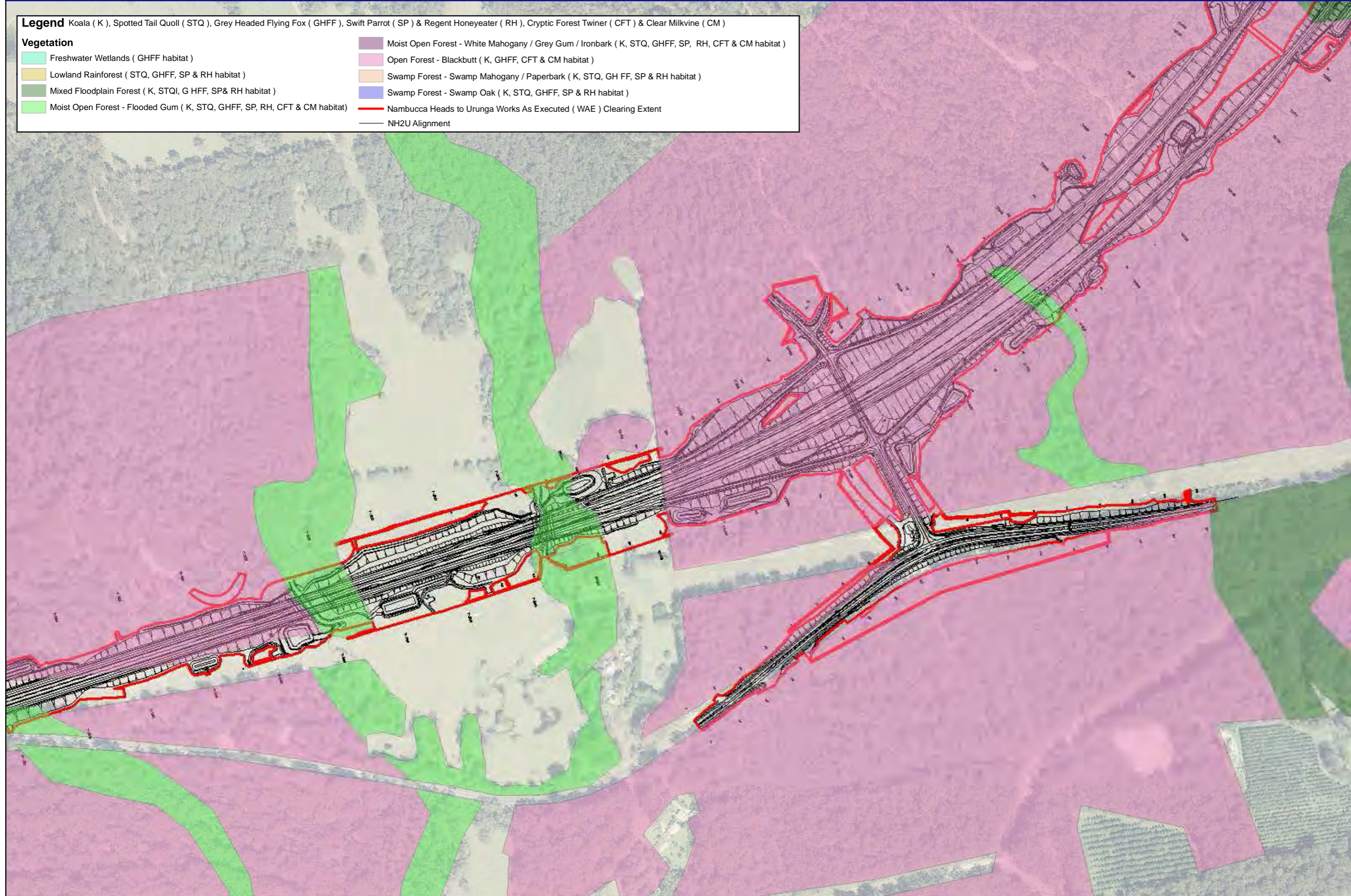


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 6

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













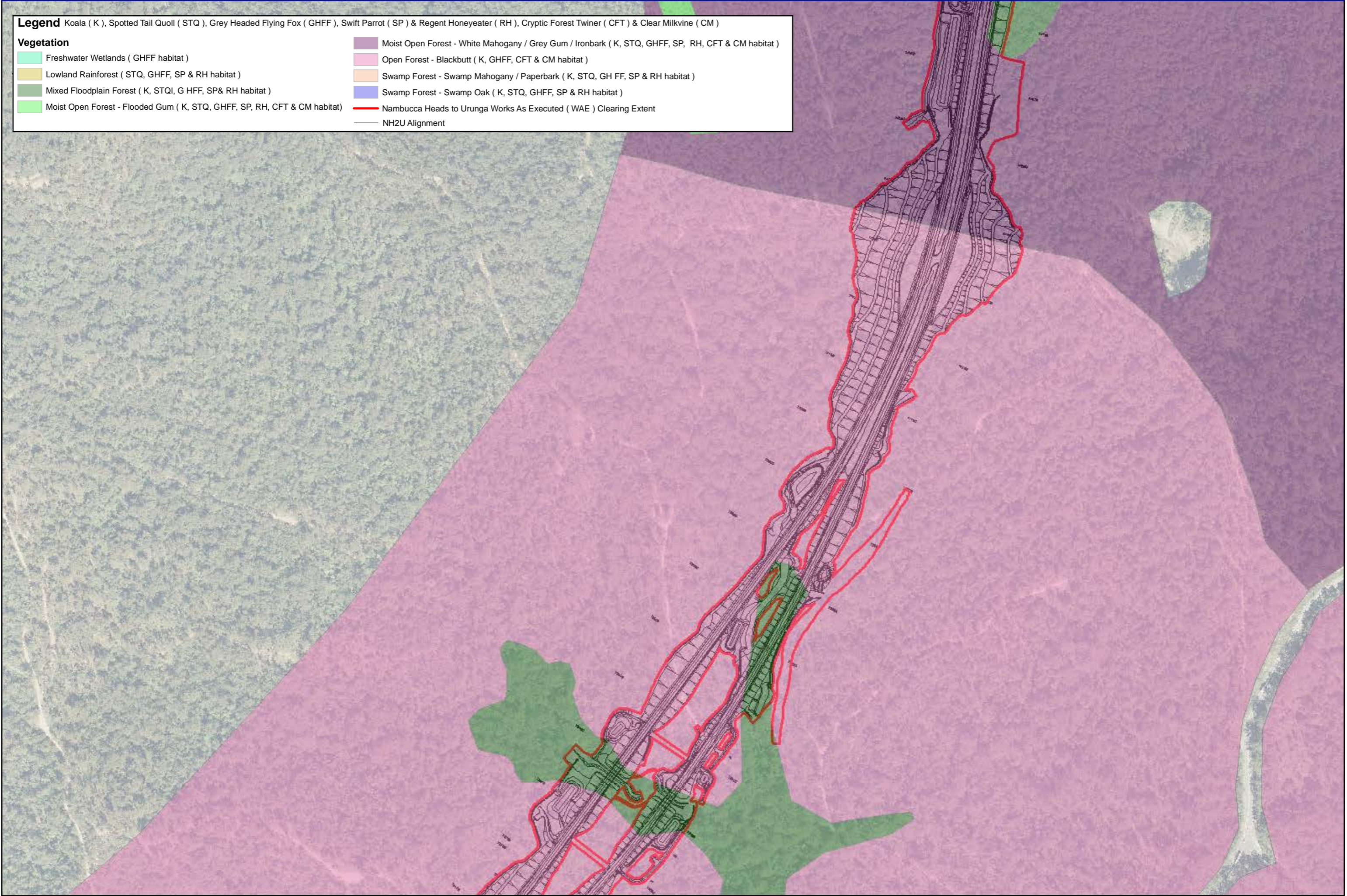


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 7

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













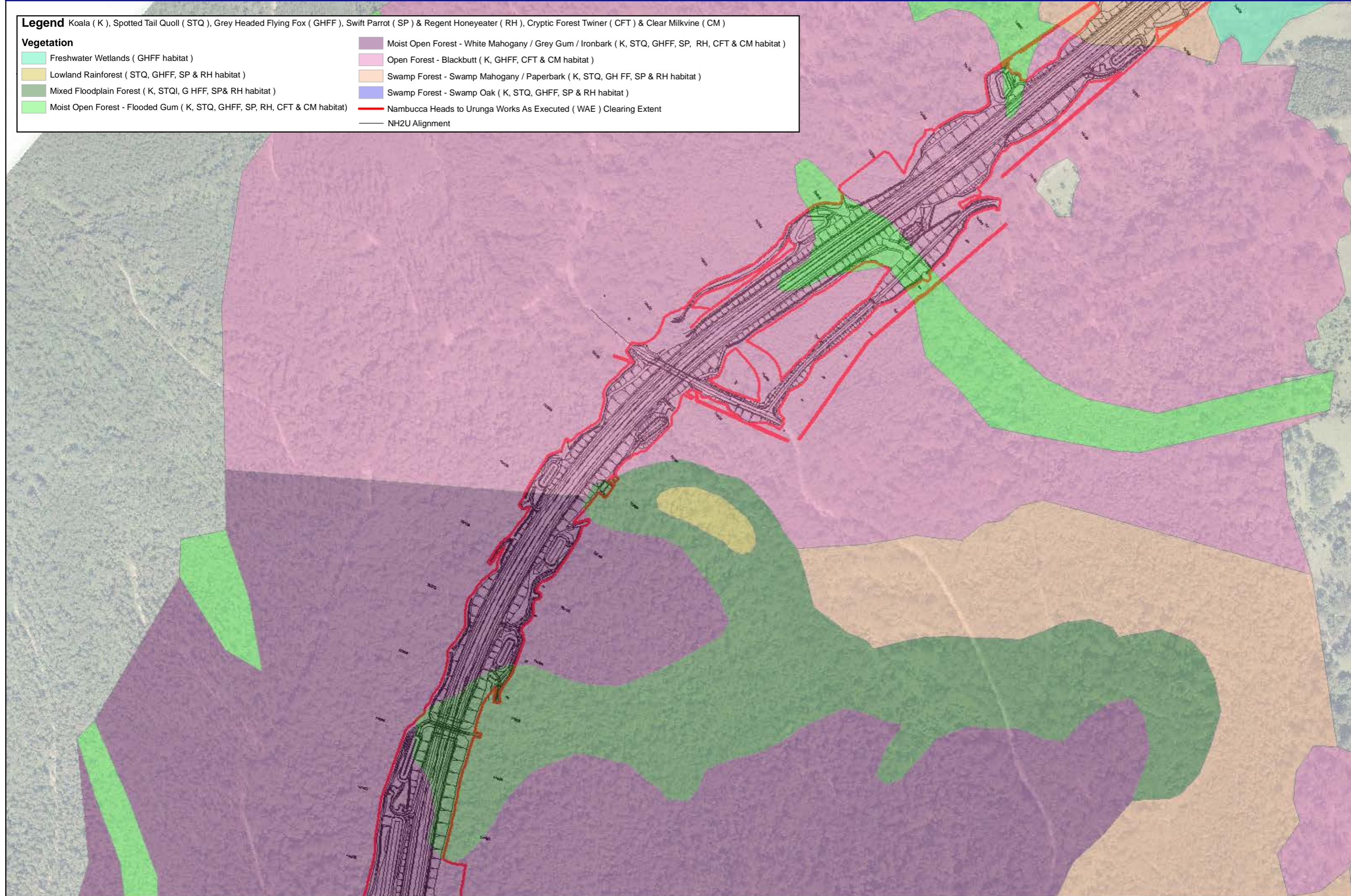


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 8

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













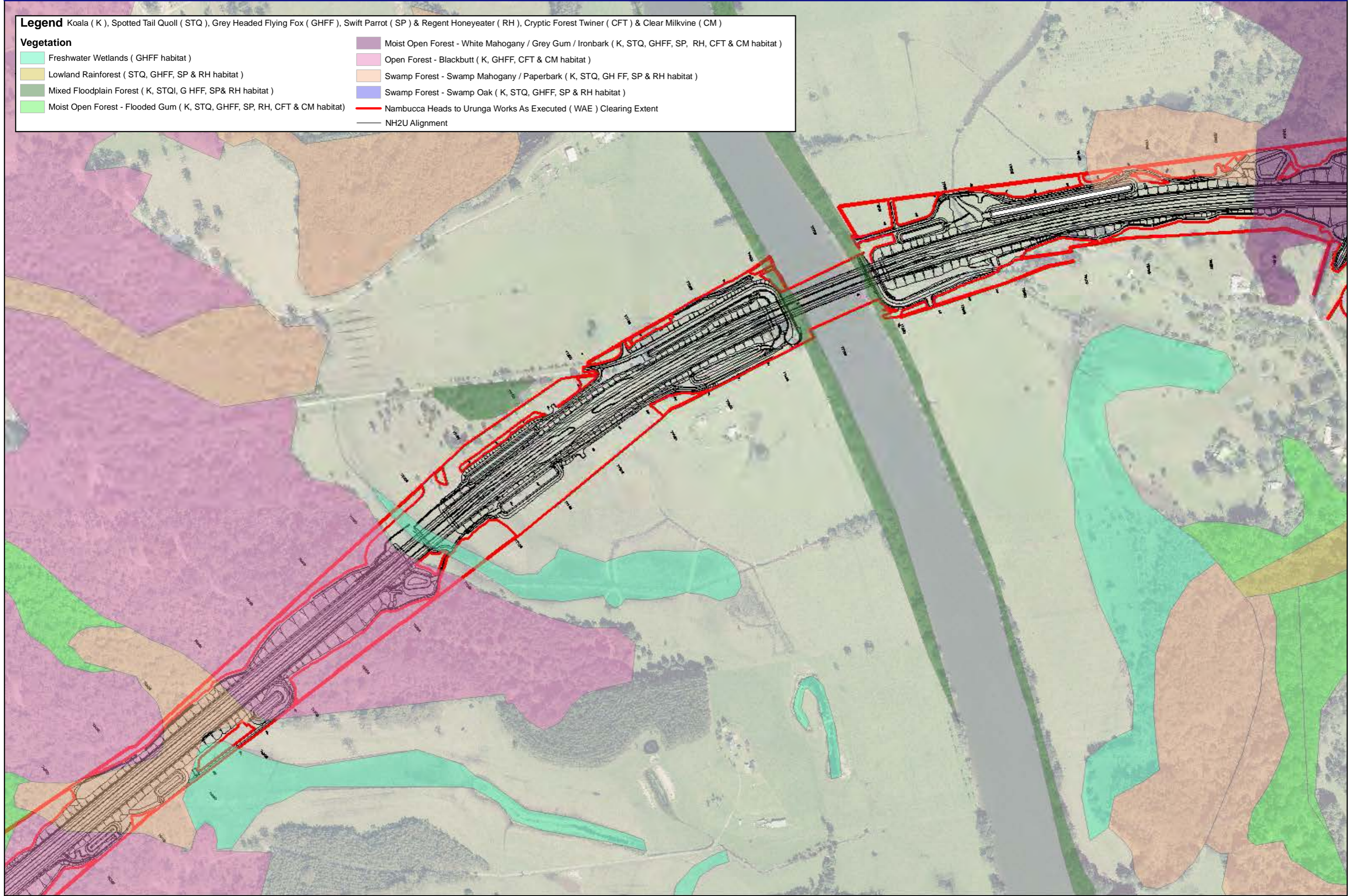


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 9

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













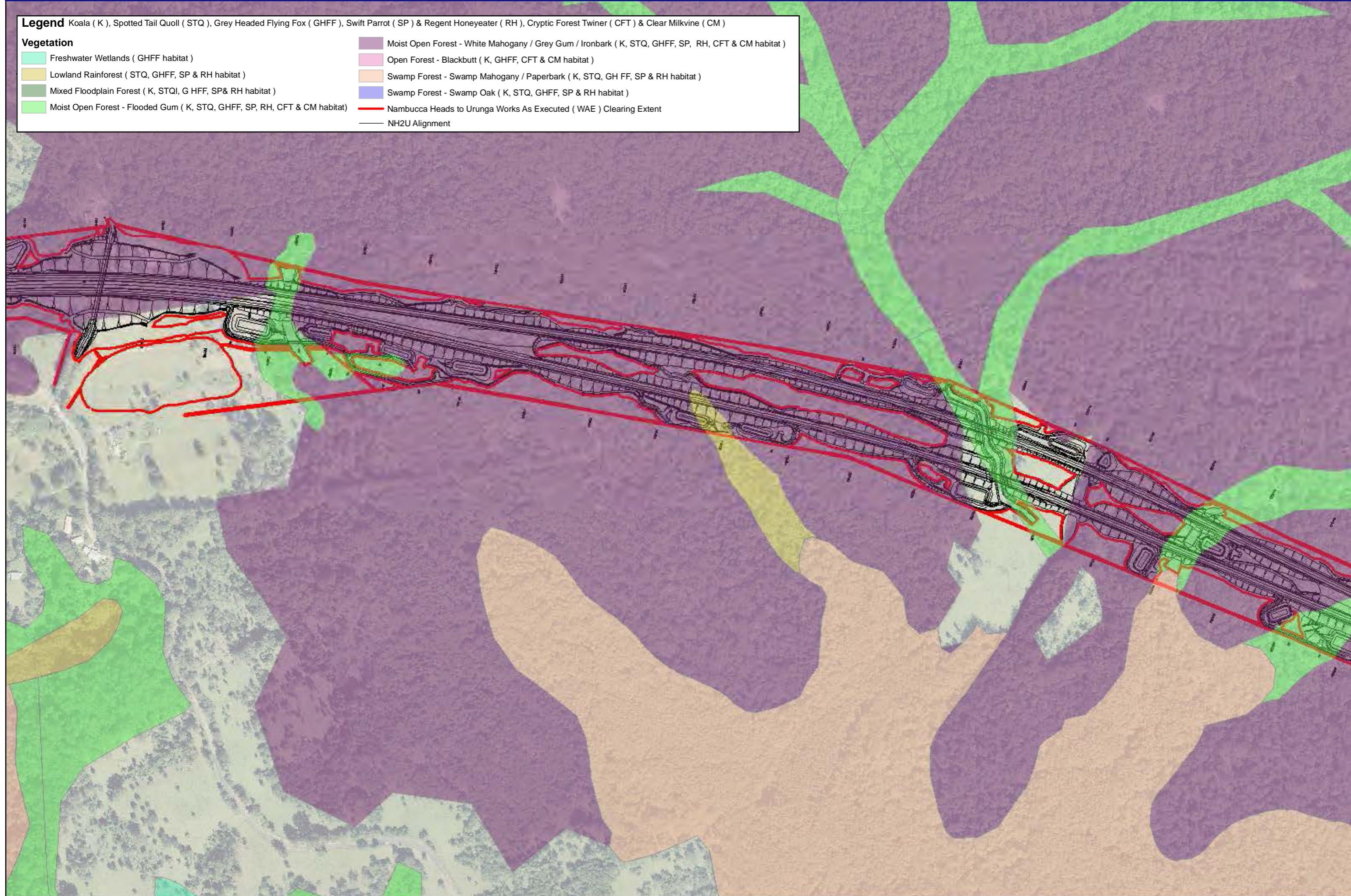


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 10

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













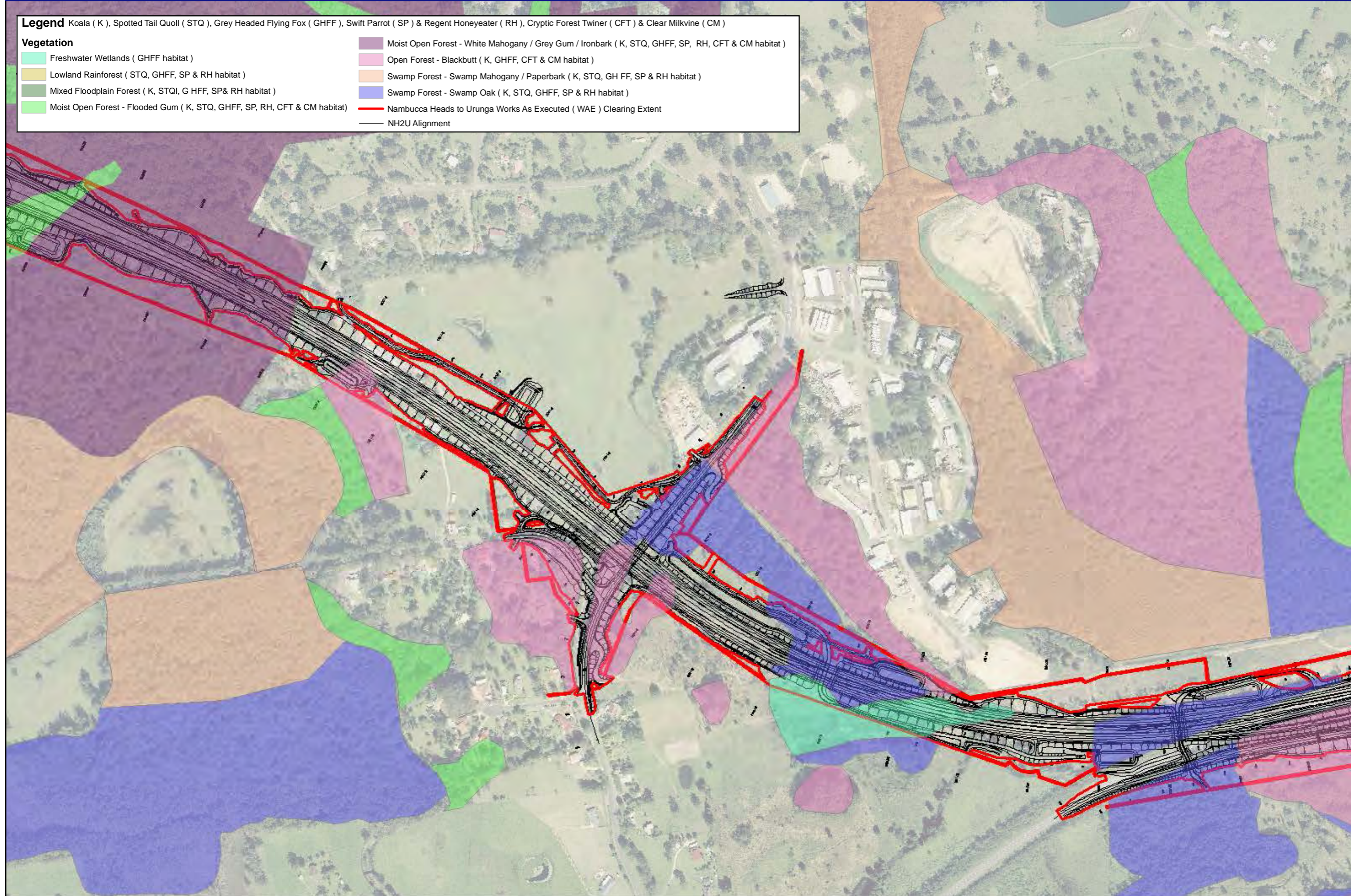


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 11

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment













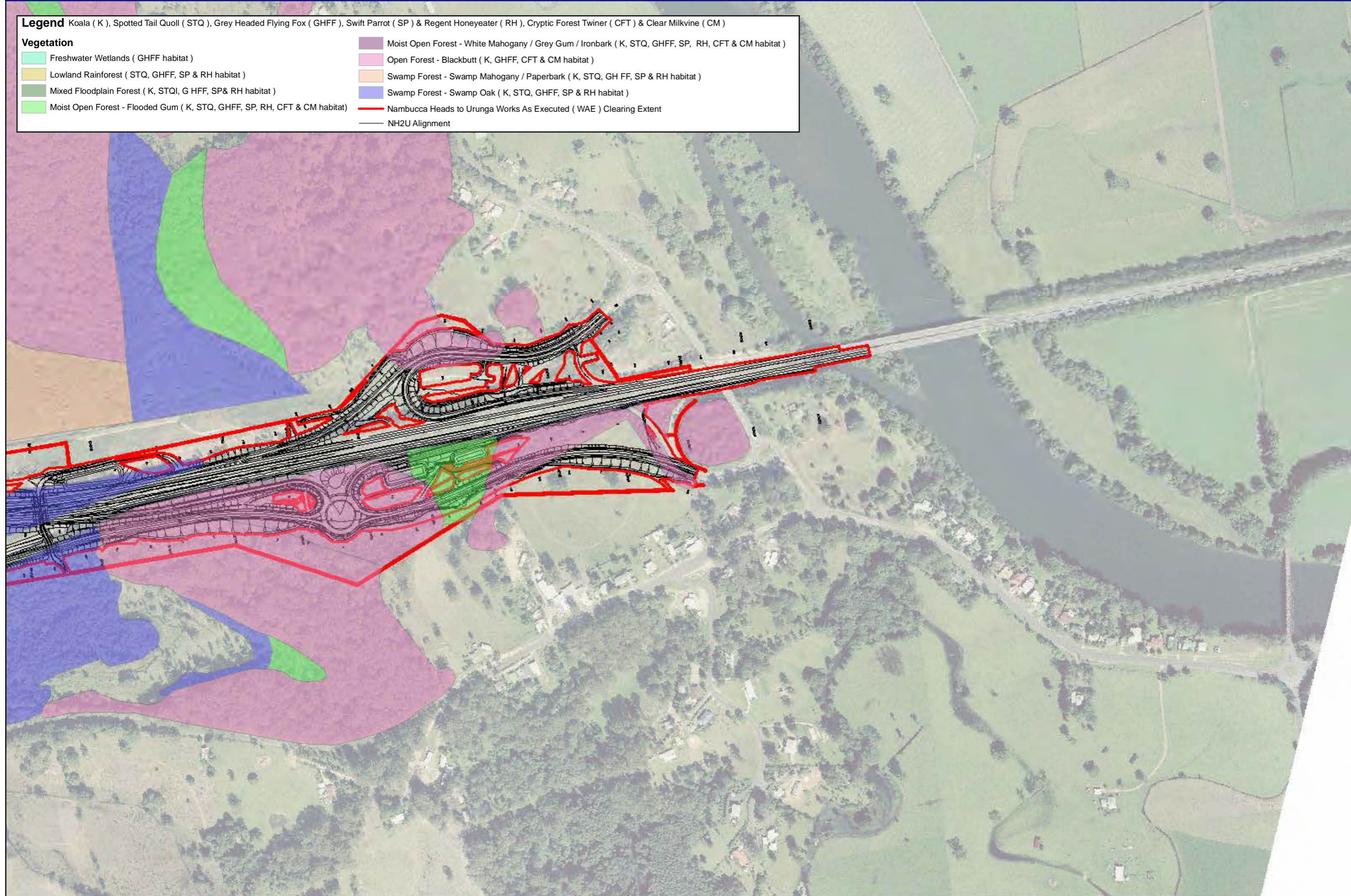


# Nambucca Heads to Urunga EPBC Habitat Works As Executed ( WAE ) Clearing Map 12

**Legend** Koala ( K ), Spotted Tail Quoll ( STQ ), Grey Headed Flying Fox ( GHFF ), Swift Parrot ( SP ) & Regent Honeyeater ( RH ), Cryptic Forest Twiner ( CFT ) & Clear Milkvine ( CM )

**Vegetation**

 Freshwater Wetlands ( GHFF habitat )	 Moist Open Forest - White Mahogany / Grey Gum / Ironbark ( K, STQ, GHFF, SP, RH, CFT & CM habitat )
 Lowland Rainforest ( STQ, GHFF, SP & RH habitat )	 Open Forest - Blackbutt ( K, GHFF, CFT & CM habitat )
 Mixed Floodplain Forest ( K, STQ, GHFF, SP & RH habitat )	 Swamp Forest - Swamp Mahogany / Paperbark ( K, STQ, GHFF, SP & RH habitat )
 Moist Open Forest - Flooded Gum ( K, STQ, GHFF, SP, RH, CFT & CM habitat )	 Swamp Forest - Swamp Oak ( K, STQ, GHFF, SP & RH habitat )
	 Nambucca Heads to Urunga Works As Executed ( WAE ) Clearing Extent
	 NH2U Alignment





Attachment 3

Condition 16 - Translocation outcomes report

## Condition 16

One year following the *completion of construction works*, *the person taking the action* must provide a report to *the Minister* detailing the long-term success of the translocation program. The report must include, but need not be limited to:

- a) background information on translocated species (in relation to ecological requirements and life history);
- b) the scope of the translocation program (with respect to timing, duration, methodology, and objectives, as well as comprehensive details on the recipient translocation site(s) and how they meet the ecological requirements of each species);
- c) details of a comprehensive monitoring program to determine the *long-term success of translocation*; and
- d) the success of translocation to date.

Action	Timing	Status	Compliance evidence
16.1 Prepare translocation outcomes report addressing specified matters and other relevant matters	March 2018	Completed	Completed report
16.2 Provide translocation outcomes report to Dept of the Environment	March 2018	Completed	Transmittal form (and any confirmation of receipt)

Information presented below is summarised from the year 1 operational phase threatened flora monitoring report (Richards 2017).

### INTRODUCTION

Where threatened or rare plants were recorded within the NH2U construction footprint and direct impact was unavoidable, a program was developed to guide the translocation and monitoring of Spider Orchid, Red Bopple Nut, Slender Marsdenia, Rusty Plum, Woolls's Tylophora, Koala Bells and Ford's Goodenia. Plants were translocated from the construction footprint into one of two recipient sites (Translocation Areas, TA1 and TA2) that adjoin the NH2U footprint and are owned and managed by RMS (Figure 2).

The translocations were conducted according to the Warrell Creek to Urunga Threatened Flora Management Plan (TFMP, Ecos Environmental 2013), which was prepared as a condition of approval from the NSW Department of Planning and Commonwealth Department of Environment.

### Translocation methods and planting layout

A thorough, detailed description of the actual salvage and translocation methodology is provided in Ecos Environmental (2013, 2014a, 2016a, 2016b). The summary provided below is also drawn from these

Ecos Environmental reports and explains the source of plant material (transplanted from construction footprint or propagated off-site), whether a slow-release fertiliser was applied, and the location within TA1 or TA2 of the transplants or enhancement plantings.

#### *Translocation Area 1*

TA1 was divided into ten sectors (A to J, Figure 3) each receiving one species and different introduction treatments, as described below:

- Transplanted from construction footprint with no addition of fertiliser.
  - Sector A Slender Marsdenia
  - Sector B Woolls's Tylophora
- Transplanted from construction footprint with no fertiliser except initial watering with seaweed solution.
  - Sector C Ford's Goodenia
  - Sector D Koala Bells
  - Sector E Rusty Plum
- Propagated vegetatively and planted in experimental grids with and without addition of slow-release fertiliser.
  - Sector F Slender Marsdenia
  - Sector G Woolls's Tylophora
  - Sector I Woolls's Tylophora
- Propagated from seed and planted in an experimental grid with and without addition of slow-release fertiliser.
  - Sector J Slender Marsdenia
- Transplanted from construction footprint with no fertiliser except initial watering with seaweed solution.
  - Sector H Red Bopple Nut

#### *Translocation Area 2*

TA2 consists of two sectors, for the Spider Orchid and Koala Bells (Figure 4).

- Spider Orchid transplanted from construction footprint, no fertiliser addition – Sector A
- Koala Bells population enhancement, no fertiliser addition – Sector B

Individuals were planted at a regular spacing, with rows about 10m apart and individual plants about 5 metres apart along rows. Where a sector was on a hill slope, grid lines were laid out parallel with the slope contour. This facilitated comparison of species performance in relation to slope position.

Monitoring, to date, has been undertaken for a total of 681 translocated plants (Ecos Environmental 2014, 2016, 2016a)

#### *Objectives of translocation*

The objectives of the translocation project set out in the TFMP are:

- To salvage and re-establish impacted individuals of threatened (TSC/EPBC Act) species.
- To re-establish species at a recipient site near the original site with closely matching habitat and long-term security of tenure.

- To enhance the size and genetic diversity of the translocated population by propagation and introduction of individuals additional to those salvaged from the road footprint.
- To maintain good quality habitat to the relocation site(s).
- To preserve individuals of threatened species *in-situ* wherever possible and limit translocation to plants within the highway footprint and construction buffer.

In accordance with the Ministers' Conditions of Approval (MCoA) for the TFMP, an annual monitoring report is to be prepared which addresses the monitoring goals, provides an evaluation of the effectiveness of the mitigation measures against performance indicators, documents any corrective actions implemented, and identifies recommendations for any adaptive management.

Upon completion of the construction phase of the NH2U upgrade, responsibility for operational management passed to the NSW Roads and Maritime Services (RMS). This report describes the results of Year 1 (operational phase) monitoring of *in situ* and translocated flora for the NH2U upgrade. It should be noted that, upon completion of construction phase monitoring of translocated plants, monitoring of those species not listed as threatened under the TSC Act or the EPBC Act (Koala Bells and Ford's Goodenia) has been discontinued.

## **MONITORING METHODS**

Monitoring of all translocated plants was undertaken over October and November 2017.

The following description of the NH2U flora monitoring methodology is adapted from Ecos Environmental (2014 to 2017). During the NH2U construction phase, monitoring of transplants was conducted every 3 months in Year 1, every 6 months in Year 2 and annually in Year 3. Population enhancement individuals were monitored twice in Year 1 thence at the same time as transplanted individuals. Ongoing monitoring during the NH2U operational phase is to be undertaken annually for a minimum five years.

Each transplanted and propagated plant was given a unique identification number which was written on flagging tape and attached to the plant itself, or to its protective wire cage. Transplants were re-located in the field using a hand-held GPS to navigate to a set of coordinates that had been recorded when the plants were introduced to the sites (in some cases coordinates were not available – in such cases a thorough search of the relevant sector was undertaken by the author, and each transplant found had locality coordinates recorded with a GPS unit). Data were recorded as per Section 3.8 of the TFMP.

## **RESULTS**

Full details of the results of the current season's monitoring of all translocated threatened plants, including all data collected in the field, is provided as an Excel™ workbook which accompanies this report.

Ecos Environmental (2016a) reported the results of a comparison of the performance of fertilised *versus* non-fertilised Slender Marsdenia and Woolls's Tylophora transplants, and survival and mean plant height between transplants that had been planted along different contour lines in each sector (i.e., a habitat preference trial). No significant difference in condition, height or survival between fertilised and non-fertilised plants was recorded, nor was any significant difference detected in the performance of transplants grown along different contour lines, from years 1 to 3. Considering these findings by Ecos Environmental, the fertiliser and habitat experiments will not be assessed or reported on in this and future monitoring reports, as 1) the fertiliser applied to plants would, by now, be depleted, and 2)

results to date indicate that the transplants are located within habitat of uniform quality for the two subject vine species.

### Slender Marsdenia

Slender Marsdenia was planted in three sectors in TA1:

- Sector A - Directly transplanted from construction footprint with no fertiliser.
- Sector F - Propagated vegetatively and introduced with and without fertiliser.
- Sector J - Propagated from seed and introduced with and without fertiliser.

#### Sector A

Survival rate for all plants in Sector A was 40% after four years, a significant decrease on the previous year (69%) and probably attributable to the extremely dry winter-spring conditions of 2017. Mean plant height decreased slightly, but not significantly, from 39.9cm to 36.3cm. 62 plants had died back (58.5%), and two plants could not be found and have possibly been lost under tree-fall debris. These results are summarised in Table 1 below.

After four years the 'thrival rate' of Slender Marsdenia in Sector A was 21% (22 plants out of 106 with a Condition Class score of 3, 4 or 5), which compares favourably to previous results. 16 of these plants were more than one metre in height. Two plants, Nos. 30b and 54, were in flower at the time of survey. The percentage of plants with active shoot growth in October 2017 was 35%.

*Table 1: Slender Marsdenia in TA1 Sector A - mean height in centimetres and percent survival of transplants.*

All plants n = 106	Mar 2014	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	36.25	36.25	42.38	39.97	36.3
Survival %	90.5	87.6	71.2	67.9	40

#### Sector F

The survival rate of all plants in Sector F was 61.1%, a small decrease on the previous survey but significantly higher than the Sector A transplant survival rate. Mean plant height was 52.4cm, a small decrease on the previous survey (Table 2).

The thrival rate after 4 years was 33.3%, higher than the Sector A transplants and comparable to the Sector J seedlings (see below). 21 plants with a condition class score of 3 or more were more than one metre in height. No plants were in bud, or flowering, at the time of the current survey.

*Table 2: Slender Marsdenia in TA1 Sector F - mean height in centimetres and percent survival of transplants.*

All plants n = 90	Jul 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	21.04	68.50	55.89	52.44
Survival %	83.63	77.1	66.75	61.1



### Sector J

Propagated seedlings of Slender Marsdenia were planted in Sector J in August 2014. Previous monitoring reports described the faster early growth of seedlings compared to transplanted individuals (Ecos Environmental 2014a). Results from the current survey reveal a significant decrease in survival rate (from 82.5% to 54.39%) and mean plant height (64.19cm to 54.61cm) since the last monitoring survey (Table 3).

After 4 years the thrival rate of Slender Marsdenia in Sector J was 32.04%, about 50% better than the thrival rate of transplants in Sector A (21%). 28 of these plants were more than one metre in height and the tallest plant was 3 metres. No plants were in flower.

Table 3: Slender Marsdenia in TA1 Sector J - mean height in centimetres and percent survival of transplants.

All plants n = 103	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	46.75	69.15	64.19	54.61
Survival %	92.2	86.4	82.5	54.39

### Woolfs's Tylophora

The Tylophora from Cow Creek (tentatively identified by the National Herbarium of NSW as Woolfs's Tylophora *T. woolfsii*, and treated as such pending confirmation of identity) was translocated to TA1 into:

- Sector B - Directly transplanted from the construction footprint with no fertiliser.
- Sector G - Propagated vegetatively and introduced with and without fertiliser.
- Sector I - Propagated vegetatively and introduced without fertiliser.

### Sector B

Mean survival rate for all plants in Sector B for the current survey was 14.29% (6 plants of 42), a significant decrease from the previous year and showing a continuing trend of decline in condition of plants in this sector. Mean plant height also decreased significantly to 4.88cm (Table 4).

The strongest indicator of the poor state of plants in this sector is the current thrival rate of 0%. No plants were assessed as condition class 3 or better, down from 3 plants recorded as such during the previous survey. As suggested by Ecos Environmental (2016a), the recipient site is on a hill crest and is much drier and more exposed than other sectors. Numerous plants of Milky Silkpod *Parsonsia dorrigoensis*, a distantly-related vine species, were observed in Sector B, indicating different habitat conditions to those normally equated with the presence of Woolfs's Tylophora and Slender Marsdenia.

Table 4: Woolfs's Tylophora in TA1 Sector B - mean height in centimetres and percent survival of transplants.

All plants n = 42	Mar 2014	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	76.31	38.84	34.07	11.73	4.88
Survival %	90.5	80	73.8	31	14.29

### Sector G

Mean survival rate for all plants in Sector G was 26.1%, a significant decrease from the previous survey, and mirroring the decline recorded in plants in Sector B. Mean plant height also decreased to 18.81cm (Table 5). The better survival rate in this sector probably reflects the less exposed position of Sector G compared to Sector B.

Thrival rate was better in Sector G compared to Sector B, but still poor, with 12 plants (13.64%) in condition class 3 or better. Of those 12 plants, 4 were more than one metre high. All living plants with aerial stems in this sector were noted as looking very similar, in the author's opinion, to *Tylophora paniculata* rather than *T. woollsi*.

Table 5: Woolls's *Tylophora* in TA1 Sector G - mean height in centimetres and percent survival of transplants.

All plants n = 88	Aug 2014	Jan 2016	Nov 2016	Oct 2017
Mean height (cm)	49.98	43.04	32.6	18.81
Survival %	95.4	56.3	48.3	26.1

### Sector I

Mean survival rate for all plants in Sector I was 15.7%, a decrease from the previous survey, and following the trend of continual decline over time displayed by all Woolls's *Tylophora* transplants in TA1. Mean height also decreased to 12.94cm, down from 16.14cm recorded in the previous survey (Table 6).

Thrival rate for plants in Sector I was 9.8% (5 plants of 51, three of which were over a metre high). Again, all plants with aerial stems were noted during the current survey as looking more like *T. paniculata* than *T. woollsi*.

Table 6: Woolls's *Tylophora* in TA1 Sector I - mean height in centimetres and percent survival of transplants.

All plants n = 51	Dec 2014	Jan 2016	Nov 2016	Nov 2017
Mean height (cm)	70.41	36.68	16.14	12.94
Survival %	86.3	47.7	21.6	15.7

### Identity of *Tylophora* transplants in TA1

During this current monitoring program, the author corresponded with Dr Andrew Benwell of Ecos Environmental, who undertook the NH2U flora translocation project, designed and instigated the monitoring program, and wrote all the Ecos Environmental reports cited herein. Dr Benwell advised (pers. comm. Oct 2017) that he retained some material of the Cow Creek Woolls's *Tylophora* plants in pots. These plants had recently flowered and are in fact *Tylophora paniculata*, a reasonably common species which is not listed as rare or threatened. This finding confirms the author's field observations of the transplants in Sectors G and I.

This outcome means that ongoing monitoring of Sectors G and I is probably no longer warranted. Sector B, on the other hand, should continue to be monitored as the identity of transplanted vines there is not clear. This recommendation has been supported by the EPA.

### Rusty Plum

#### Translocated Rusty Plums

Two small Rusty Plum trees (4-8m high) were transplanted into Sector E in TA1. One tree had split and was separated into two pieces (plants 1 and 2) before planting. The other tree (plant 3) was pruned back to remove most of the branch system before being transplanted.

The current survey revealed a survival rate of 67%. Plant 1 bore a healthy, basal stem shoot which had doubled in size from the previous survey in November 2016. Plant 2 appeared to be dead, and Plant 3 was in excellent health with a flush of new growth.

#### *Rusty Plum enhancement plantings*

Ecos Environmental (2016a) noted that most of the 40 Rusty Plum seeds planted directly into 20 points within Sector E of TA1 had germinated, but no protective wire cages were installed, resulting in heavy losses to browsing by wallabies and possums. Ten of the direct seeded points (50%) had live Rusty Plum seedlings in January 2016. This number had decreased to six (30%) by Nov 2016. During the current survey, only three points with Rusty Plum seedlings were recorded, a survival rate of 15%.

This decline in seedling numbers serves to highlight the importance of installing protective cages around seedlings. The author's experience with monitoring both direct-seeded and seedling Rusty Plums in a receival site as part of the Sapphire to Woolgoolga Pacific Highway Upgrade (Richards 2016) showed that, with protective cages in place, survival after 5 years was 51% and 65% respectively. A recommendation to install tree guards to protect rusty plums from browsing has been supported by RMS and guards will be installed in 2018.

#### **Red Bopple Nut**

A single Red Bopple Nut tree was transplanted to Sector H in TA1. The tree was recorded in excellent condition during the current survey. It bore numerous inflorescences, although no fruit-set was observed at the time of the survey.

#### **Spider Orchid**

Six of the original Spider Orchid transplants were stolen from TA2 just after translocation had occurred, leaving 60 plants at the recipient site (Ecos Environmental 2016a). The rate of survival of transplanted Spider Orchids, based on the results of the current monitoring survey, indicates a decline to 78.3% survival, compared to previous survey results which reported over 90% survival (Table 7). This figure may underestimate actual survival, as 10 plants were not able to be re-located in October 2017. The recipient site was flooded after heavy rains when the current survey took place, making access difficult. It is therefore probable that some of the plants listed as missing will be re-located during the next survey.

Apart from the apparent decline in survival rate, other results showed an improvement in the population, including a small increase in the mean number of pseudobulbs with leaves per plant, and a significant jump in the number of plants bearing new shoots. Offsetting these increases, however, was a decline in mean length of the longest pseudobulb. As mentioned previously, in the results of the *in-situ* Spider Orchid monitoring, it appears that this may be due to differing methods of measuring pseudobulb length between report authors.

Median condition class of the translocated Spider Orchids was 2, which is the same as the previous survey. Several old inflorescence axes were observed during the current survey, but no evidence of fruit production was recorded.

Table 7: Summary of monitoring results for Spider Orchid transplants at TA2.

Attribute	Mar 2014	Dec 2014	Jan 2016	Nov 2016	Oct 2017
Mean length of the longest pseudobulb (cm)	8.22	8.22	8.56	8.56	6.55
Mean number of pseudobulbs with leaves	1.95	1.73	2.40	2.40	2.43
Number of plants with new shoots (pseudobulbs)	1	6	10	10	15
Survival (%; n=60)	96.4	92.7	94.6	94.6	78.3

### Evaluation of Flora Translocation Program

The following performance indicators are used to evaluate the success of the threatened species translocations (salvage translocation and population enhancement):

- a) All directly impacted individuals of threatened species were salvaged and relocated to the receival sites.
- b) At least 60% of transplant and enhancement individuals are surviving after the first year, 50% after five years and 40% after eight years.
- c) At the end of the monitoring program (8 years), at least 50% of surviving individuals have a Condition Class of 3 or higher.

Table 8 below summarises how the above performance indicators have been met to date.

Table 8: Evaluation of performance indicators for translocated flora.

Species	All directly impacted individuals of threatened species were salvaged and relocated to the receival site(s).	At least 60% of transplant and enhancement individuals are surviving after the first year, 50% after five years and 40% after eight years	At the end of the monitoring program (8 years), at least 50% of surviving individuals have a Condition Class of 3 or higher.	Performance indicators met?
Slender Marsdenia	Y	Y, n/a, n/a	n/a	2 of 3 to date
Woolfs's Tylophora	Y	Y, n/a, n/a	n/a	2 of 3 to date
Rusty Plum	Y	Y, n/a, n/a	n/a	2 of 3 to date
Red Bopple Nut	Y	Y, n/a, n/a	n/a	2 of 3 to date
Spider Orchid	Y	Y, n/a, n/a	n/a	2 of 3 to date

It is clear from Table 15 above that the performance indicators are designed to provide an assessment of translocation success mainly for the latter half of the program (years 5 to 8). Because of this, little can be gleaned from this current assessment, apart from some specific comments below.

### **Slender Marsdenia**

The current (Year 4) mean survival rate of all Slender Marsdenia plants stands at 51.8%. Based on the author's knowledge of other translocations of this species, this is a comparatively good result. However, successful achievement of the performance indicators for this species is most likely as dependent on climatic factors as much as anything else. Should the region experience a severe winter-spring drought like the 2017 episode, then the survival rate of Slender Marsdenia transplants would be expected to decline as more plants die back in response to dry conditions. On the other hand, should milder conditions prevail then significantly more Slender Marsdenia plants might be expected to produce aerial shoots and be in better overall condition.

### **Woolfs's Tylophora**

The current (Year 4) mean survival rate of all Woolfs's Tylophora (now known to be mostly *T. paniculata*) stands at 18.7%, with a correspondingly low median condition class score of 1. If this low survival and condition persists, then the translocation of this species will have failed all survival and condition class performance indicators. It is of interest to note the poor translocation performance of what has turned out to be a quite common species.

### **Rusty Plum**

Because all Rusty Plum transplants and half the Rusty Plum enhancement plantings survived through Year 1, at present Rusty Plum meets relevant performance criteria. As at Year 4, Rusty Plum transplant survival is 67%, which, if maintained, will meet ongoing performance criteria. However, the enhancement planting survival rate is currently only 15%, which equates to failure of performance criteria for Year 5, should these rates continue. This failure in performance of Rusty Plum is largely due to easily preventable browsing of enhancement plantings by wildlife. Replenishing the enhancement plantings via direct seeding and installation of tree protectors would most likely reinstate the success of the Rusty Plum plantings. This recommendation has been supported by RMS and will be implemented in 2018.

### **Spider Orchid**

The current (Year 4) survival rate of 78.3% is probably an underestimate of the actual rate of survival of Spider Orchid plants at TA2, as explained above. Overall, the translocation of Spider Orchid plants has been successful, and it is expected that performance indicators will be met in the future for this species.

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