

Appendix N

**Ecological Interpretation – BioCondition
Survey**

GHD Haughton Pipeline 2 Biocondition Survey

Introduction

This short report explains the method and results of a field based BioCondition survey along the proposed Haughton Pipeline 2 alignment. Map (GIS layers) files and a spreadsheet containing BioCondition results accompany this report.

Survey was conducted along the length of the alignment from the proposed pickup point in the Burdekin River near Mt Dalrymple to its end at the Upper Haughton from 15 to 28 March 2022. The weather was warm and dry and the ground layer was largely fertile making herbaceous plant identification relatively easy. Eighteen (18) BioCondition sites were surveyed along the alignment.

A number of limitations to the survey are discussed as well as sources of information used to accurately assign Regional Ecosystem codes to sections of the pipeline alignment.

GIS operations were carried out using QGIS (QGIS Development Team (2022)). Plant names and naturalised status follow Brown (2021).

Method - Desktop

Determining the location and number of sites

A verified and updated version of the V12 Regional Ecosystem map coverage (DES (2021)) developed by NRA (NRA (2021)) was intersected with the proposed pipeline alignment buffered 20m to match the expected 40m wide clearing footprint.

The area of each mapped RE and non-remnant area within this layer was calculated and used to create a list of Assessment Units (AUs) as per BioCondition guidelines (Eyre et al. (2015)). Two sites were proposed in each AU with an area of 2 ha or more and one site for the remaining AUs larger than 0.5ha (the size of a standard BioCondition plot).

Ideally, extensive AUs should be surveyed across their range of occurrence to capture condition differences due to management style and other variables.

RE mapping in 40m buffer

The pipeline alignment GIS layer was buffered 20m either side and this layer was divided along its length at mapped vegetation boundaries. Following field work and using a range of sources, RE codes were applied to these sections (some of these were modified to reflect boundaries encountered on the ground) of the buffered pipeline alignment. Sources used area given in Table 1. Field data collected as part of this project was used as the primary source of information in labelling sections with RE codes. Along inaccessible sections of the alignment, secondary and tertiary sources were used to infer the correct RE code for sections of the project area. In addition, various 1969 vintage aerial photograph frames (QAP1959013, QAP1958037 and QAP1956039) were used along with current satellite imagery (Department of Resources (Queensland) (2022)).

Table 1: Sources used in assigning RE codes to polygons

Source	Details	Importance	Reference
Field Data	Field observations made as part of this project, both quaternary level observations and BioCondition surveys.	Primary	This project
RE mapping V12	Most recent published version of State Regional Ecosystem mapping.	Secondary	DES (2021)
Land Unit Mapping	Land unit mapping derived from air photo interpretation, internal report to Burdekin Dry Tropics.	Secondary	Kahler (2010)
NRA Sites	Field observations provided in report to GHD on behalf of Townsville City Council.	Secondary	NRA (2021)
Landsystem Mapping	CSIRO land unit mapping from 1952, precursor and foundation to RE mapping in Queensland.	Tertiary	Christian et al. (1953)
Soils mapping	Soils mapping projects carried out by the State, typically includes details on soils structure and texture as well as landform information.	Tertiary	Reid and Baker (1984), Thompson et al. (1990)

Method - Field

BioCondition survey method

The pipeline was accessed by vehicle and on foot through various properties. Field survey method followed that outlined in Eyre et al. (2015). Tree heights were measured using a clinometer and laser rangefinder.

Linear (stream) sites were surveyed with the 100m tape situated at the toe of bank in the streambed and all measurements and surveys were conducted on the bank side of the tape (i.e. the nested plots within the BioCondition site were all shifted so a long edge sat on the 100m tape line). The outside box, normally 100m by 50m was elongated to 200m by adding 50m to each end of the 100m tape. The outside box extended out 25m upslope from the 100m tape.

Navigation and Map Correction Notes

Quaternary (rapid) sites were surveyed where confirmation of REs was required. Typically, plant layer height and cover notes were collected along with photographs.

Notes were made where navigation issues were encountered.

Results – Desktop

A number of Assessment Units were derived from the RE coverage as shown in Table 2. As the RE coverage was partly inaccurate, additional Assessment Units were created post-field to accommodate REs present on site but not found in the existing mapping. These are given at the bottom of Table 2.

Table 2: REs along alignment and corresponding Assessment Units

RE List by Area	Area (ha)	Assessment Units	Sites required
11.3.7 Total	32.37	AU1 (11.3.7)	2
11.3.35 Total	26.07	AU2 (11.3.35)	2
11.3.9 Total	24.34	AU3 (11.3.9)	2
11.3.30 Total	9.91	AU4 (11.3.30)	2
non-rem 11.3.35	5.44	AU5 (non-rem 11.3.35)	2
11.3.25b Total	3.44	AU6 (11.3.25b)	2
non-rem 11.3.7	2.86	AU7 (non-rem 11.3.7)	2
11.3.4a Total	2.63	AU8 (11.3.4a)	2
11.12.1 Total	2.41	AU9 (11.12.1)	2
11.3.10 Total	2.41	AU10 (11.3.10)	2
11.3.25 Total	1.46	AU11 (11.3.25)	1
non-rem 11.3.25	0.65	AU12 (non-rem 11.3.25)	1
		Total Sites Required:	22
REs excluded due to size restrictions			
11.3.35a Total	0.44	AU13 (11.3.35a)	1
11.3.13 Total	0.13	AU14 (11.3.13)	1
AUs added post-field			
non-rem 11.3.31	unknown	AU15 (non-rem 11.3.31)	-
11.3.31	unknown	AU16 (11.3.31)	-
non-rem 11.3.30	unknown	AU17 (non-rem 11.3.30)	-
non-rem 11.12.1	unknown	AU18 (non-rem 11.12.1)	-

Results – Field

REs and Assessment Units

A number of remnant REs were recognised in the field (Table 3). Non-remnant areas were assigned possible or original RE codes, however, these should be seen only as the most likely possibility based on what limited evidence was available. Attached GIS files (Digital Attachment 4 and Digital Attachment 5) label sections along the alignment and in the stockpile areas and tracks with Assessment Unit and RE codes as per Table 2 and Table 3.

Table 3: REs in the alignment

RE Code and AU Code	Short Description from REDD ¹	Concept as Used in this Report
11.3.4a AU8	<i>Corymbia tessellaris</i> woodland. On alluvial sandridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict. Occurs on deep, loose neutral to alkaline red or pale uniform sand or non-sodic texture contrast soil. This unit has very low subsoil salinity in all profiles (Burgess 2003). Floodplain (other than floodplain wetlands). (BVG1M: 9e)	<i>Corymbia tessellaris</i> dominated woodlands on loose sandy soils of (typically) abandoned levees.
11.3.7 AU1	<i>Corymbia</i> spp. open woodland on alluvial plains.	Woodlands including <i>Eucalyptus platyphylla</i> and <i>Corymbia clarksoniana</i> on loamy soils of active and abandoned levees.
11.3.31 AU16	<i>Ophiuros exaltatus</i> , <i>Dichanthium</i> spp. grassland on alluvial plains.	Wooded grasslands or very open woodlands in broad drainage depressions with heavy, sometimes gilgaied and cracking, clay soils. Typically wooded with <i>Eucalyptus platyphylla</i> or <i>Corymbia tessellaris</i> .
11.3.25b AU11	<i>Melaleuca leucadendra</i> and/or <i>M. fluviatilis</i> , <i>Nauclea orientalis</i> open forest. A range of other canopy or sub-canopy tree species also occur including <i>Pandanus tectorius</i> , <i>Livistona</i> spp., <i>Eucalyptus tereticornis</i> , <i>Corymbia tessellaris</i> , <i>Millettia pinnata</i> , <i>Casuarina cunninghamiana</i> , <i>Livistona decora</i> , <i>Lophostemon suaveolens</i> or <i>L. grandiflorus</i> , rainforest species and, along drainage lines, <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> . A ground layer of tall grasses such as <i>Chionachne cyathopoda</i> , <i>Mnesithea rottboellioides</i> or <i>Heteropogon triticeus</i> may be present. Often occurs on coarse sand spits and levees within larger river channels. Riverine wetland or fringing riverine wetland. (BVG1M: 22c)	Streams including bed, banks and levees with <i>Melaleuca</i> spp. and <i>Lophostemon grandiflorus</i> woodland. Typically a range of other tree species are present. Sandy and loamy soils.
11.3.35 AU2	<i>Eucalyptus platyphylla</i> , <i>Corymbia clarksoniana</i> woodland on alluvial plains.	Woodland of <i>Eucalyptus platyphylla</i> and / or <i>Corymbia tessellaris</i> woodland or open woodland on plains with duplex or clay sodic soils.

¹Queensland Herbarium (2021).

BioCondition Sites

Eighteen (18) BioCondition sites were surveyed (see Table 4).

Table 4: BioCondition survey sites and results

BioCondition Site Number	RE Assigned	Assessment Unit	BioCondition Site Score	BioCondition Landscape Score	BioCondition Total Score	BioCondition Class
BC01	11.3.7	AU1	41.5	20	61.5	2
BC02	Non-rem (Originally 11.3.7)	AU7	38	5	43	3
BC03	Non-rem (Originally 11.3.31)	AU15	0	4	4	4
BC04	11.3.35	AU2	47.5	19	66.5	2
BC05	Non-rem (Originally 11.3.31)	AU16	8	20	28	3
BC06	Non-rem (Originally 11.3.31)	AU16	13	20	23	3
BC07	11.3.35	AU2	33	20	53	3
BC08	11.3.35	AU2	48.5	19	67.5	2
BC09	11.3.35	AU2	45.5	19	64.5	2
BC10	Non-rem (Originally 11.3.30)	AU17	39.5	19	58.5	2
BC11	11.3.25b	AU6	53.5	20	73.5	2
BC12	11.3.35	AU2	43	20	63	2
BC13	11.3.4a	AU8	35	20	55	3
BC14	11.3.35	AU2	48	20	68	2
BC15	11.3.35	AU2	43.5	14	57.5	3
BC16	11.3.35	AU2	51	20	71	2
BC17	Non-rem (Originally 11.3.35)	AU5	5.5	0	5.5	4
BC18	11.3.25b	AU6	47.5	19	66.5	2

The grassland RE 11.3.31 was observed on site. Its remnant status was decided after comparing field data with the 3-part definition given in the *Vegetation Management Act 1999* (QLD). BioCondition benchmark information is not published for this RE. Figures used in assessing the condition of RE11.3.31 areas were drawn partly from the REDD entry for this RE and are presented in Table 5. Note that attributes relating to woody plants are not used in assessing grassland REs.

Table 5: Benchmark figures used in assessing the condition of RE11.3.31 areas.

Grass Species Richness	Forb Species Richness	Perennial Grass Cover	Litter Cover
8	6	70	30

Areas and overall proportions of each AU in both the buffered pipeline alignment and the stockpile areas and tracks are given in the attached spreadsheet ('GHD Houghton Pipeline 2 BioCondition Scores') in worksheet 'RE and AU Areas'. These areas were calculated in GIS (QGIS 2022) and summarised in MS Excel.

Attached GIS files (Digital Attachment 4 and Digital Attachment 5) contain area figures (in hectares) for both the buffered pipeline alignment and the stockpile areas.

Site photos, a zip folder showing GIS locations and BioCondition field data sheets are available from this [Dropbox folder](#):

(<https://www.dropbox.com/scl/fo/y89s9zj07y029jnq1frtu/h?dl=0&rlkey=plf4shok05up7sdzzgtulnskh>)

Survey Effort

GIS shapefiles showing the extent of on-ground survey, both the tracks traversed and the site data collected, are included in the attached GIS files (Digital Attachment 2 and Digital Attachment 3).

Limitations and Notes

Field survey

Access was limited in places due to lack of vehicle tracks or flooded areas. As a result, some stretches of the alignment were not well surveyed.

RE descriptions

The REDD descriptions of REs in the project area are sometimes not well defined, particularly with respect to typical landforms. Consequently, RE concepts used in assigning RE codes to plant communities found on site area explained in Table 3.

Remnant status of grasslands

The Remnant status of grassland REs is mostly only able to be determined by field survey (wooded REs can, to a degree, be identified as remnant through aerial photo and satellite image interpretation). Some grassland areas labelled as Remnant in the attached GIS layers may be non-remnant, depending on the composition of the ground layer.

Misalignment of provided map layers

Slight misalignment between on-ground cleared areas, especially vehicle tracks, and provided GIS layers indicating proposed haul roads were assumed to have resulted from hand digitising errors. In such cases, the provided alignments were regarded as indicative and that the intent was to use existing cleared property tracks and roads.

Category R area

Quaternary site Q19a was captured in an area marked by the State as Category R (regrowth watercourse) under the VM Act. It's not clear what this might mean in terms of regulation of activities under the VM Act.

Attachments

The following files are provided as separate digital attachments:

Digital Attachment 1- GHD Haughton Pipeline 2 BioCondition Scores

Digital Attachment 2- GHD Haughton Pipeline 2 Field Data Points

Digital Attachment 3- GHD Haughton Pipeline 2 Field Data Tracks

Digital Attachment 4- GHD Haughton Pipeline 2 Revised REs in Construction Footprint

Digital Attachment 5- GHD Haughton Pipeline 2 Stockpile Infrastructure Areas

Photographs and Field Data Sheets available for a limited time at this [Dropbox link](https://www.dropbox.com/scl/fo/y89s9zj07y029jng1frtu/h?dl=0&rlkey=plf4shok05up7sdzzgtulnsh):
<https://www.dropbox.com/scl/fo/y89s9zj07y029jng1frtu/h?dl=0&rlkey=plf4shok05up7sdzzgtulnsh>.

Document Information

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Report, attached spreadsheet and GIS layers prepared by Chris Kahler of Ecological Interpretation (ecointerp@mac.com) under contract by GHD to address client obligations regarding BioCondition survey along the Haughton 2 Pipeline, Lower Burdekin, North Queensland.		
Other:		
All GIS operations carried out in the production of this report used Quantum GIS open source software (QGIS Development Team (2022)).		
Plant names and naturalised status follow Brown (2021).		

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