

Worsley Alumina

LITTLETON'S CUTTING CLEARING APPLICATION SUPPORTING DOCUMENTATION

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

The Overland Bauxite Conveyor (OBC) is an important asset of BHP Billiton Worsley Alumina Pty Ltd (Worsley) and is critical to its operations. Construction of the OBC commenced in 1980 and the section known as Littleton's Cutting has been excavated through mainly residual and extremely weathered soils, derived from granites and dolerites with overlying laterite caprock, that are susceptible to erosion.

The cutting has a history of localized stability issues related to progressive erosion of the slopes over many years. These issues are covered by previous geotechnical reports issued by GHD (1998, 2001, 2004, 2006 and 2007). In the past, numerous, localized debris slides triggered by rainfall events have spilled onto the OBC access road, often filling the drains on both sides of the conveyor. Historically, remedial works have been conducted in two instances where required.

Potential failure of the slopes in this cutting poses significant health, safety and operational risks to Worsley's operations. Due to the erodible nature of the materials, the slopes of the cutting have deteriorated over time and have reached a stage where some benches and storm water drains have been undermined, leaving the area in a potentially dangerous state. These benches are likely to deteriorate further unless remedial works are carried out to prevent erosion and stabilise the banks.

Remedial measures to address these stability issues have been developed by Worsley and GHD based on risk assessments, staged geotechnical assessments and detailed engineering design.

In order to facilitate these remedial works, it is proposed to clear up to 2.71 ha of vegetation on the northern side of Littleton's Cutting (Figures 1 and 2). The clearing is required to allow for re-engineering of the walls of the cutting, improvement of drainage, development of a fill deposit area and to allow for vehicle and machinery access at the top of the cutting. The proposed clearing can be divided into three distinct areas:

- Remedial works and machinery access at top of Littleton's Cutting;
- Development of fill deposit area (including topsoil/mulch stockpile areas); and
- Equipment laydown area.

The remedial works and machinery access at the top of Littleton's Cutting combined with the fill deposit area will require up to 2.66 ha of vegetation to be cleared (Figure 1). The equipment laydown area on the Littleton's property is approximately 0.05 ha of regrowth in an area that has previously been cleared and will require the removal of isolated saplings to be utilised as a laydown area (Figure 2).

1.2 SITE DESCRIPTION, TENURESHIP AND ACCESS

The proposed works are located along the OBC, approximately 10 km from the Saddleback mining area and 40 km from the Refinery, along the northern slope of Littleton's Cutting (Figure 3).

The 'cut' portion of these works will reform an existing cutting on Crown Lease land and Worsley Joint Venture (JV) Land (Figure 2). Crown Land will be required to be accessed and cleared to complete the works. Fill operations to the west of the cutting will extend an existing berm on Worsley JV Land.



Access to Littleton's Cutting will be via Harvey-Quindanning Road and through an adjacent farming property belonging to the Littleton family. A Letter of Understanding outlining this access agreement is provided as Appendix A. Figure 2 shows the existing track that will be utilised through the farming property to transport machinery and other equipment to Littleton's Cutting as well as a previously cleared laydown area that will again be utilised as a laydown area for the current proposed works.

The area of Crown Land between the farming property and Littleton's Cutting falls within Alcoa's mining lease ML1SA, and Worsley has sought permission from Alcoa to access this area. Alcoa has stated it does not object to Worsley accessing the area, provided that Worsley accepts any liability arising as a result of Worsley (and its employees, contractors, invitees etc) acts or omissions while on ML1SA. A copy of this correspondence is provided as Appendix B.

Harvestable timber within State Forest and Crown Land is the property of the Forest Products Commission (FPC). Prior to any works commencing on site, harvestable timber will be reviewed by the FPC and flagged in the field. These trees will be removed and stockpiled for later collection by the FPC.

2 EXISTING ENVIRONMENT

2.1 CLIMATE

The climate is warm Mediterranean, with the average yearly rainfall for Boddington being approximately 673 mm (Bureau of Meteorology 2010). Rainfall in the winter months for 2010 was approximately 50% of the historical average.

2.2 TOPOGRAPHY

The topography of Littleton's Cutting has been modified due to the construction of the conveyor. The conveyor lies at approximately 250 mAHD, rising sharply to 275 mAHD at the top of the northern slope and gently sloping to 185 mAHD on approach to Harvey-Quindanning Road. Figure 2 shows the topography of Littleton's Cutting and the surrounds.

2.3 LAND USE & REGIONAL SETTING

Littleton's Cutting comprises land cleared for the conveyor and associated infrastructure with native vegetation along the benches and upper slopes, some of which is regrowth. Regionally, the area is predominantly State Forest with Worsley's mining activities to the east and wheat and sheep farming also to the east and north converging around the Murray, Hotham and Williams River systems.

2.4 SURFACE WATER

The nearest surface water body is the Murray River which is approximately 550 m north of the conveyor at its nearest point. Surface drainage lines follow the local contours in a northerly direction down slope from the conveyor towards the Murray River.

2.5 GEOLOGY

The following text has been extracted from GHD's 1998 report:

"The area forms part of the Western Gneiss Terrain within the Yilgarn Craton. Characteristic rock types are Archaean banded gneiss discordantly intruded by granitic rocks, and later intruded by Proterozoic dolerite dykes. Localised shear deformation, associated with movement along the Darling Fault 15 km to the west, produced cross cutting quartz veins. Subsequent weathering during a period of tropical climate conditions in Tertiary times produced deep lateritic weathering profiles.

The extent of lateritic weathering is highly variable. Relatively little lateritic weathering has occurred in the first four cuttings (L/S 1235 to 1861)) and fresh rock is exposed throughout beneath a surficial layer of colluvial and residual soils. The rock has wide to very widely-spaced joints (0.2 m to 2 m), and joint surfaces are commonly slightly weathered and iron-oxide coated. Rocky exposures are commonly separated by zones of intense weathering characterised by sandy, silty and clayey soils susceptible to erosion. The contact between pale-coloured granitic rocks and darker-coloured dolerite is occasionally sheared and the sheared zone weathered, however, there is often a transition from one rock type to another with no zone of intermediate shearing and weathering.

Gordon & Smith (1984) and Gordon & Phillips (1991) have discussed the geological setting of the deepest cutting, Littleton's Cutting. The weathered Precambrian

banded gneisses are reported to dip 20° to the north-east, and the intrusive dolerite dykes dip at 60° to 85° towards the south. Shears within the weathered granite and at the margin of dolerite dykes reportedly have slickensided planes with red or brown oxide coating, and faults at low angles of dip strike parallel to the dykes. These pre-existing features are potential slope failure surfaces.

The depth of lateritisation is reported to be up to 50 m, and the depth to the water table is 50 m. Lateritisation results in a strengthened material in the higher, ferruginized part of the weathering profile, while materials in the leached pallid zone are susceptible to erosion. The top 20 m or so is cemented by iron and aluminium sesquioxides, and the underlying, weaker pallid zone is susceptible to both slope wash and direct infiltration which can cause rapid slope deterioration.

The intrusive dolerite dykes weather to active soils containing the clay mineral montmorillonite, and active soils are present in weathered shear zones. Relict joints are present throughout the clay profile, and bands of corestones in the dolerite have been preserved by local jointing and shearing which has isolated them from lateritic weathering processes. Slope failure may also occur on relict joint planes and the corestones are subject to undermining by erosion of the surrounding soil."

2.6 FLORA AND VEGETATION

A flora and vegetation survey of the northern Littleton's Cutting area (including the area proposed to be cleared and wider surrounds) was conducted in September 2010 by Mattiske Consulting Pty Ltd. A complete copy of the resulting report is provided as Appendix C, with a summary provided below.

A total of 16 sites were selected from aerial photography for on the ground flora and vegetation sampling. A total of 61 vascular plant taxa from 45 plant genera and 27 plant families were recorded within the Littleton's Cut Survey Area. The majority of taxa recorded were of the Fabaceae (11 taxa), Proteaceae (5 taxa) and Myrtaceae (4 taxa) families (Mattiske, 2010).

No plant taxa listed as a Priority flora species by the Department of Environment and Conservation (2010a) or Declared Rare Flora species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* [WA] were recorded at the Littleton's Cutting area. Four introduced (exotic) taxa were recorded, with none of these listed as Declared Plant species pursuant to section 37 of the *Agricultural and Related Resources Protection Act 1976* according to the Western Australian Department of Agriculture and Food (2010).

Five site-vegetation types were defined and mapped for the Littleton's Cutting area as detailed in Table 1 (Figure 4). These site-vegetation types are representative of Havel's site-vegetation types for the northern Jarrah Forest Region (Havel 1975a, 1975b), and the legend adopted aligns these with those defined in the nearby Mt Saddleback and Marradong survey areas. These site-vegetation types are widely distributed within the Northern Jarrah Forest and are well represented in the Dwellingup and Yalanbee vegetation complexes within the conservation estate (Hedde et al. 1980; Mattiske and Havel 1998; Conservation Commission 2003).

Table 1 Site Vegetation Types (SVTs) recorded for the Total Survey Area

SITE VEGETATION TYPE CODES		DESCRIPTION	AREA PROPOSED FOR CLEARING (ha)
Havel (1975a)	Worsley		
M	11W1	<p>Open Woodland of <i>Eucalyptus wandoo</i>, and to a lesser extent on the upper range <i>Eucalyptus marginata</i>. Other indicator species include <i>Lasiopetalum cardiophyllum</i>, <i>Trymalium ledifolium</i>, <i>Stylidium dichotomum</i> and <i>Xanthosia atkinsoniana</i> (site-vegetation type M as defined by Havel (1975a). In previous studies for Worsley Alumina Pty Ltd this site-vegetation type has also been designated the code 11W1 (E.M. Mattiske and Associates 1993).</p> <p>This site-vegetation type occurs primarily on the middle to upper reaches of valley slopes in the drier eastern part of the Darling Scarp, on generally shallow loamy gravel soils supporting a sparse understorey. This type is widespread in distribution within the Northern Jarrah Forest and is well represented in the Yalanbee vegetation complexes within the conservation estate (Heddl et al. 1980; Mattiske and Havel 1998; Department of Conservation and Land Management 1987).</p>	0.155
Z	19JMr	<p>Open forest of <i>Eucalyptus marginata</i>, <i>Corymbia calophylla</i>. Other indicator species include <i>Macrozamia riedlei</i>, <i>Xanthorrhoea preissii</i> and <i>Phyllanthus calycinus</i>. In previous studies for Worsley Alumina Pty Ltd this site-vegetation type has also been designated the code 19JMr (E.M. Mattiske and Associates 1993).</p> <p>This site-vegetation type occurs on upper-slopes and uplands in the medium to low-rainfall areas within the Northern Jarrah Forest (Havel 1975a). This type is widespread in distribution within the Northern Jarrah Forest and is well represented in the Pindalup, Yarragil and Yalanbee vegetation complexes within the conservation estate (Heddl et al. 1980; Mattiske and Havel 1998; Department of Conservation and Land Management 1987).</p>	0.375
S	19JBg	<p>Open forest of <i>Eucalyptus marginata</i>, <i>Corymbia calophylla</i> with admixtures of <i>Allocasuarina fraseriana</i>. Other indicator species include <i>Acacia celastrifolia</i> and <i>Senecio leucoglossus</i>. In previous studies for Worsley Alumina Pty Ltd this site-vegetation type has also been designated the code 19JBg (E.M. Mattiske and Associates 1993).</p> <p>This site-vegetation type occurs on the upper slopes, and to a lesser degree mid slopes, of the undulating hills on the Darling Ranges. The type is widespread in distribution within the Northern Jarrah Forest and is well represented in the Dwellingup vegetation complexes within the conservation estate (Heddl et al. 1980; Mattiske and Havel 1998; Department of Conservation and Land Management 1987).</p>	0.571
Disturbed		Disturbed/rehabilitated area	1.556

SITE VEGETATION TYPE CODES		DESCRIPTION	AREA PROPOSED FOR CLEARING (ha)
Havel (1975a)	Worsley		
TS	19JBG/19 JSd	Open forest of <i>Eucalyptus marginate</i> and <i>Corymbia calophylla</i> . Other indicator species include <i>Pteridium esculentum</i> , <i>Phyllanthus calycinus</i> and <i>Macrozamia riedlei</i> . This site-vegetation type is a variant of two site-vegetation types as defined by Havel (1975a). In previous studies for Worsley Alumina Pty Ltd this site-vegetation type has also been designated the code 19JBG/19JSd (E.M. Mattiske and Associates 1993). This site-vegetation type occurs on the upper slopes, and to a lesser degree mid slopes, of the undulating hills on the Darling Ranges. The type is widespread in distribution within the Northern Jarrah Forest and is well represented in the Dwellingup vegetation complexes within the conservation estate (Heddl et al. 1980; Department of Conservation and Land Management 1987).	0 (none of this vegetation type is present within the proposed clearing area)
G	23HDc	Open to closed heath or shrubland of Myrtaceae – Proteaceae spp. on shallow granitic soils. In previous studies for Worsley Alumina Pty Ltd this site-vegetation type has also been designated the code 23HDc (E.M. Mattiske and Associates 1993). This site-vegetation type occurs on the shallow soils associated with granite outcrops. It is relatively widespread in distribution within the Northern Jarrah Forest and is well represented in the conservation estate (Heddl et al. 1980; Conservation Commission 2003).	0 (none of this vegetation type is present within the proposed clearing area)
		Total	2.712

The condition of the vegetation in the surveyed area ranged from very good to completely degraded using the condition rating scale outlined in "Bush Forever" (Government of Western Australia 2000 based on Keighery 1994) (Figure 5). Clearing and rehabilitation associated with the conveyor line, as well as agricultural activities, have significantly modified the vegetation structure and composition in some areas (Mattiske, 2010).

The area identified in Figure 2 as the Laydown Area is an area which was cleared approximately 10 years ago for laydown purposes during previous remedial works, and it is proposed to clear the regrowth in this area for laydown purposes rather than cleared previously uncleared land. This laydown area of 0.054 ha is included in the calculations for Table 1.

2.7 PHYTOPHTHORA CINNAMOMI OCCURRENCE

Glevan Consulting conducted a *Phytophthora cinnamomi* occurrence assessment of the Littleton's Cutting area in October 2010. A complete copy of the assessment is provided as Appendix D with Figure 6 showing the mapped occurrence of *P. cinnamomi* in the survey area.

The assessment found that areas cleared for the OBC were unmappable due to the lack of vegetation. The majority of the remaining survey area, which includes the area proposed for vegetation clearing, was uninterpretable due to a lack of key indicator species.

Within the assessment area a large portion of the uninterpretable areas were dominated by *Xanthorrhoea preissii* in the understorey. Although *X. preissii* is susceptible to *P. cinnamomi*, it can also be very resistant even in areas where *P. cinnamomi* is having a high impact on vegetation (Glevan Consulting, 2010). Occasional *X. preissii* deaths were

scattered throughout the uninterpretable area. Glevan Consulting advised these could be due to *P. cinnamomi*, but also due to other factors such as fire or drought which are a common cause of death in these steep exposed granite sites (Glevan Consulting, 2010).

Two of the *X. preissii* plants which had died were sampled and sent for laboratory analysis. These locations are GDA E440350 N6350734 and E440503 N6350772 which have been demarcated in the field. Testing by Vegetation Health Service has revealed that both of these samples were negative for the presence of *P. cinnamomi* (Appendix E).

Two pockets of vegetation outside of the proposed clearing area were mapped as being free of *P. cinnamomi* (Figure 6), and have been demarcated in the field to ensure appropriate forest hygiene measures are implemented should work occur in these two areas at some time in the future.

3 SCOPE OF WORKS

3.1 DEMARCATION OF ENVIRONMENT

All areas proposed to be cleared will be surveyed and clearly demarcated in the field such that no areas beyond those proposed will be cleared. Demarcation of areas to be cleared will be in strict adherence with any subsequent clearing permits attained.

Harvestable timber as detailed in Section 1.2 will be flagged in the field and stockpiled for later removal, and wherever practicable, significant fauna habitat trees will also be identified and preserved during remedial works.

3.2 BULK EARTHWORKS

Excavations will conform to the lines, grades, cross sections and dimensions shown in Figures 7 to 12. The slope of compacted fill or the excavated embankment surfaces will not be any steeper than those shown on Figures 7 to 12. Existing tracks will be used where possible (such as the existing track through the Littleton property) and no new tracks will be created in areas outside this clearing application.

3.3 STRIPPING, STOCKPILING AND RE-SPREADING OF TOPSOIL

Topsoil is to be stripped and stockpiled from all areas to be excavated, and re-spread following completion of earthworks as directed by the Worsley rehabilitation advisor.

Worsley's Topsoil and Overburden Handling Specification 113212¹ (Appendix F) defines topsoil as the top 150 mm of soil. Topsoil shall be removed and handled separately from excavated material to prevent dilution or loss of biological values and will not be relocated between land of different tenureships. Instead topsoil will be stockpiled within the area from which it was stripped in adherence with forest hygiene procedures. Topsoil stockpiles shall be a maximum of 2 m high to minimise the deterioration of seed, nutrients and soil biota.

3.4 DISPOSAL OF MATERIAL

3.4.1 Vegetation

Scrub and trees up to 150 mm diameter shall be mulched and re-spread as a component of topsoil upon completion of works, as directed by the Worsley rehabilitation advisor.

Harvestable timber flagged by the FPC shall be logged and stockpiled accordingly. Other trees greater than 150 mm diameter which are required to be removed shall be logged and stockpiled at the Refinery.

Forest Hygiene Procedure 101046 (Appendix G) will be adhered to at all times with regard to the movement and stockpiling of vegetative material.

3.4.2 Soil Material

All excavated soil shall be placed in the designated fill disposal area (Figures 8 and 10). Excavated soil that is unsuitable for backfilling or other filling requirements, shall be removed

¹ Please note that all procedures referred to within this report and provided as appendices, are as approved by the Department of Environment and Conservation (DEC) through the DEC-Worsley Working Arrangements.

from site and disposed of as directed by the Superintendent in accordance with waste disposal regulations. Excavated soil material will be placed and compacted in uniform layers of 300mm to 90% of the maximum dry density.

The slope of the compacted soil shall not be steeper than those shown in Figures 9 and 10. Fill material will be clean and free from roots, wood, masonry, plastic, rubbish, building rubble, organic matter, large stones and/or any other deleterious material.

3.5 DRAINAGE

Drainage will conform to the lines, grades, cross-sections, detailing and dimensions shown in Figures 11 and 12. All existing and new concrete channels and overland drains will be cleared of soil, debris and rocks to ensure they are free flowing. All existing drains, including the drain which runs under the road between the cut area and fill area, will be maintained throughout the duration of works.

An earthen bund will be constructed at the crest of the shaped cutback slope (Figure 11) to prevent runoff across the slope's face. At the toe of the cutback slope, the area between the new face and the existing concrete channel drain will be trimmed and shaped to accept a 150 mm thick layer of compacted lime stabilised soil that forms a 5% crossfall into the concrete channel drain (Figures 11 and 12).

An overland drain will be constructed at the base of the fill deposit area between the toe of the slope and the Littleton property boundary. The drain is to be blended into the existing drain, as shown on Figure 11.

A new concrete channel drain will be constructed along the crest of the fill deposit area slope and down the western face, and will tie in between the existing concrete channel, the new concrete channel and the new overland drain. Any dislodged concrete channel drain sections will be reset and caulk/grout will be used between concrete channel drain sections with cement mortar.

Any solid matter (mud and silt in suspension) present in surface runoff water within the designated work areas will be removed via entrapment, settlement and/or other methods prior to being directed to the natural environment. Silt screens will be used as required at the boundary of the Crown Land and Littleton's property.

3.6 REVEGETATION

Subsequent to the completion of works, topsoil will be returned to cleared areas and mulched material incorporated through the topsoil to improve stabilisation. Mulched material will not be placed on top of topsoil directly as this has the potential to impede seedling germination and establishment. Following topsoil return these areas will be seeded at a rate of approximately 1 kg/ha using locally sourced native seed supplied by the Boddington Bauxite Mine Environmental Department.

4 ENVIRONMENTAL IMPACTS & MANAGEMENT

4.1 VEGETATION & FLORA MANAGEMENT

A total of 2.71 ha is proposed to be cleared to allow for the remedial works, development of the fill disposal area and the laydown area. As shown in Table 2, 57.4% of this vegetation was rated as being 'completely degraded' in Mattiske's 2010 assessment, 28.6% was rated as being in 'very good' condition with the vegetation structure altered and showing obvious signs of disturbance; while the remaining 14% was rated as being in a 'good' condition with vegetation structure significantly altered by very obvious signs of multiple disturbance.

Table 2 Vegetation Condition of Site Vegetation Types (SVTs)

RATING	DEFINITION*	AREA PROPOSED FOR CLEARING (ha)
Pristine	Pristine or nearly so, no obvious signs of disturbance	0.00
Excellent	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species	0.00
Very Good	Vegetation structure altered, obvious signs of disturbance	0.778
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance, retains basic vegetation structure or ability to regenerate it	0.378
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management	0.00
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost without native species	1.556
Total		2.712

*Definitions as adopted from "Bush Forever" (Government of Western Australia, 2000)

All areas proposed to be cleared will be surveyed and clearly demarcated in the field such that no areas beyond that proposed will be cleared. Demarcation of areas to be cleared will be in strict adherence with any subsequent clearing permits attained.

Wherever practicable, significant fauna habitat trees will be identified and not removed or harmed during remedial works.

The site dieback status has been determined as uninterpretable and as such, dieback hygiene procedures will be implemented as outlined in Section 4.3. Dieback hygiene procedures will also serve to minimise the potential for the movement of weeds between farming and forest land.

Revegetation will follow clearing as closely as possible as described in Section 3.6.

4.2 FAUNA MANAGEMENT

Given the small, degraded size of the proposed clearing area, the vegetation present is unlikely to provide significant habitat for any potential priority fauna species present within the area. There are vast tracts of State forest, timber reserves and other designated reserves to the west, northwest and south which are likely to have a higher rate of utilisation by native fauna seeking habitat and/or foraging sites.

With the exception of the fill disposal area, the removal of trees for remedial works will be strictly limited to that required to allow for the redevelopment of benches along the cutting as

well as machinery access. Any significant habitat trees such as those containing nests, will be left standing if practicable to do so.

Strict vehicle speed limits will be imposed to minimise the risk of injury to fauna (in addition to reducing the potential for injury to people, dust generation and erosion potential). Any fauna deaths resulting from vehicle impacts will be recorded and reported in the Annual Environmental Report. Contractors will be encouraged to report any sightings of native wildlife and/or feral animals to the BBM Environmental Department.

4.3 FOREST HYGIENE MANAGEMENT

The risk of spreading dieback and Armillaria infections, as well as introducing weeds into forest zones from pasture areas is a major focus.

Given that the dieback status of the subject area is uninterpretable, Worsley will consider the area to be dieback infested and implement forest hygiene protocols accordingly. Hygiene procedures for scrapers, light vehicles and other development equipment will be rigorously followed. A copy of Worsley's Forest Hygiene Management Procedure is provided as Appendix G.

The management measures outlined below will reduce the potential to spread dieback and Armillaria infections as well as reducing the potential to spread weeds into forested areas:

- A Traffic Management Plan will be developed and implemented which will include forest hygiene management measures.
- All contractors working onsite will be made aware of the forest hygiene procedures and the ensuing clean-down requirements of the site, and locations in which this is to occur.
- Prior to entering the OBC corridor, all vehicles will first wash-down utilising the washdown facilities at the refinery and/or mine. Vehicles entering the OBC access road will be clean on entry and exit and are to stay on formed, well drained tracks.
- A clean-down point will be established at the boundary between the forest area and the Littleton's farming property. All equipment and vehicles will be inspected prior to entering forested areas from the farm property with all soil and plant material to be removed.
- Vehicles and equipment may be cleaned-down in the field utilising:
 - brooms and brushes (under dry conditions only);
 - washdown units – Vehicle Mounted Standard Work Instruction 104432 (Appendix H);
 - washdown units – Trailer Mounted Standard Work Instruction 104434 (Appendix I);
 - water trucks.
- Dry brush down will be encouraged during dry conditions to minimise both water usage and the generation of wash-down water.
- Wash-down in off-site areas will be undertaken on a well drained surface where water runoff is minimised or contained and is not allowed to flow into forest areas or onto other properties.
- All wash-down water will be treated with the correct dosage of sodium hypochlorite to ensure that no disease is carried in the water.



- As part of standard OBC procedures, all vehicles travelling on the OBC access road are required to have an OBC Quarantine Permit. This permit allows vehicles access to the bitumen OBC Corridor Access Road only.
- Topsoil will not be relocated between land of different tenureships and will be stockpiled within the area from which it was stripped.
- The two identified dieback free areas are demarcated in the field and no access to these areas will be permitted during the course of works.
- All drainage along the OBC corridor will be maintained in good condition.
- Where clearing is carried out, a perimeter drain will be prepared to permit collection of all water runoff into a settling sump.

4.4 DUST MANAGEMENT

All operations will conform to the requirements outlined in "Land Development Sites And Impacts On Air Quality – A Guideline for the Prevention of Dust and Smoke Pollution From Land Development Sites in Western Australia" (DEP, 1996). The following dust control measures will be implemented to reduce the likelihood of dust emissions from site:

- Wind fences will be provided by the contactors and used as required.
- No burning of cleared vegetation material will be permitted on site.
- Rehabilitation works will follow the conclusion of remedial works as closely as possible to minimise the time over which land is left open and susceptible to erosion/dust generation.
- Areas of disturbed land will be stabilised with interim measures until such time that rehabilitation works commence.
- Mulched vegetation will be reincorporated into the soil profile to assist with soil stabilisation and to reduce runoff and erosion until such time that native vegetation re-establishes from viable seed in the returned topsoil and Worsley seed mix.
- A water truck will be made available should deleterious conditions arise which require the wetting down of loose and friable material on site.

4.5 SPILLS, WASTE & HAZARDOUS MATERIALS MANAGEMENT

No fuel will be stored onsite, instead a service truck will be utilised to refuel equipment. A designated refuelling area will be constructed and bunded in accordance with AS 1940 – 2004 "The Storage and Handling of Flammable and Combustible Liquids" (Standards Australia, 2004).

A spill kit will be located onsite and the contents replenished as required. OBC vehicles carry small kits suitable for small spills, with large spill kits located in each of the drive houses.

4.6 BUSH FIRES

Contractors onsite will take extreme caution not to create any fires during construction activities and will adhere to fire, harvest and vehicular movement bans at all times. In the event of a fire, contractors and Worsley employees will comply with Worsley's Bush Fire Response Procedure 100984 (Appendix J).

5 CONSIDERATION OF THE 10 CLEARING PRINCIPLES

(1) Native vegetation should not be cleared if it comprises a high level of biological diversity.

The area proposed to be cleared consists of 2.71 ha of vegetation in 'completely degraded' to 'very good' condition. Clearing and rehabilitation associated with the conveyor line, as well as agricultural activities, have significantly modified the vegetation structure and composition in some areas. It is therefore considered that the removal of this vegetation is unlikely to be at variance to this principle.

(2) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Given the small, degraded size of the proposed clearing area, the vegetation present is unlikely to provide significant habitat for any potential priority fauna species present within the area. There are vast tracts of State forest, timber reserves and other designated reserves to the west, northwest and south which are likely to have a higher rate of utilisation by native fauna seeking habitat and/or foraging sites.

(3) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

The vegetation and flora survey conducted by Mattiske did not identify any rare flora within the proposed clearing area and it is therefore considered that the proposal is unlikely to be at variance to this principle.

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

The vegetation and flora survey conducted by Mattiske did not identify any threatened ecological communities within the proposed clearing area and it is therefore considered that the proposal is unlikely to be at variance to this principle.

(5) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

The vegetation types identified by Mattiske in their 2010 survey are widespread in distribution within the Northern Jarrah Forest and are well represented in the conservation estate (Hedde et al. 1980, Department of Conservation and Land Management, 1987). It is therefore considered that the proposal is unlikely to be at variance to this principle.

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

There are no watercourses or wetlands associated with the area to be cleared, and the vegetation types identified by Mattiske are representative of upland communities. Given the lack of watercourses and/or vegetation associated with a watercourse or wetland, it is considered that the proposal is unlikely to be at variance to this principle.

(7) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

The proposal has the potential to contribute to land degradation if the management measures outlined in Section 4 are not implemented. With slope stabilisation techniques using mulched vegetative material, revegetation to follow clearing as closely as possible, the installation of appropriate drainage and wind breaks and/or sediment screens as required and the availability of a water truck, wind and soil erosion impacts should be minimised such that the proposal is not at variance to this principle.

(8) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Given the distance to the nearest conservation estates, it is unlikely that the proposed clearing will be at variance to this principle.

(9) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Given the distance to the nearest surface water bodies and drainage controls that will be put in place during construction (with permanent drainage channels installed for the life of project), it is unlikely the proposed clearing will cause deterioration to the quality of surface or groundwater such that the proposal is at variance to this principle.

(10) Native vegetation should not be cleared the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

The proposed clearing is unlikely to increase runoff to the extent that it causes or exacerbates the incidence or intensity of flooding. Drainage has been considered in the design works and will adequately direct surface water flows to existing concrete channels and drains.

6 CONCLUSION

Given the size of the area proposed to be cleared, the degree of existing vegetation degradation, the widespread distribution and representation within the conservation estate of the vegetation types identified and the management measures proposed it is considered that clearing can be conducted without compromising any of the 10 Clearing Principles discussed in Section 5.

7 DEFINITIONS, TERMS AND ABBREVIATIONS

%	Percent
BBM	Boddington Bauxite Mine
BWAPL	BHP Billiton Worsley Pty Ltd
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection (former DEC)
DMP	Department of Mines and Petroleum
FPC	Forest Products Commission
ha	Hectare
JV Land	Land owned by Worsley Joint Venture Owners (BHP Billiton 86%, Japan Alumina Associates (Australia) Ltd 10% and Sojitz Alumina 4%)
km	Kilometre
m	Metre
mAHD	Elevation in metres with respect to the Australian Height Datum
mm	Millimetre
OBC	Overland Bauxite Conveyor

8 REFERENCES

Internal Document Type	Document Number	Document	WAPL Status
Standard	111928	BBM Site Drainage	Published
Procedure	100984	Bush Fire Response	Published
Procedure	101046	Forest Hygiene Management	Published
Specification	113212	Topsoil and Overburden Handling	Published
Work Instruction	104432	Washdown Units Vehicle Mounted	Published
Work Instruction	104434	Washdown Units Trailer Mounted	Published

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