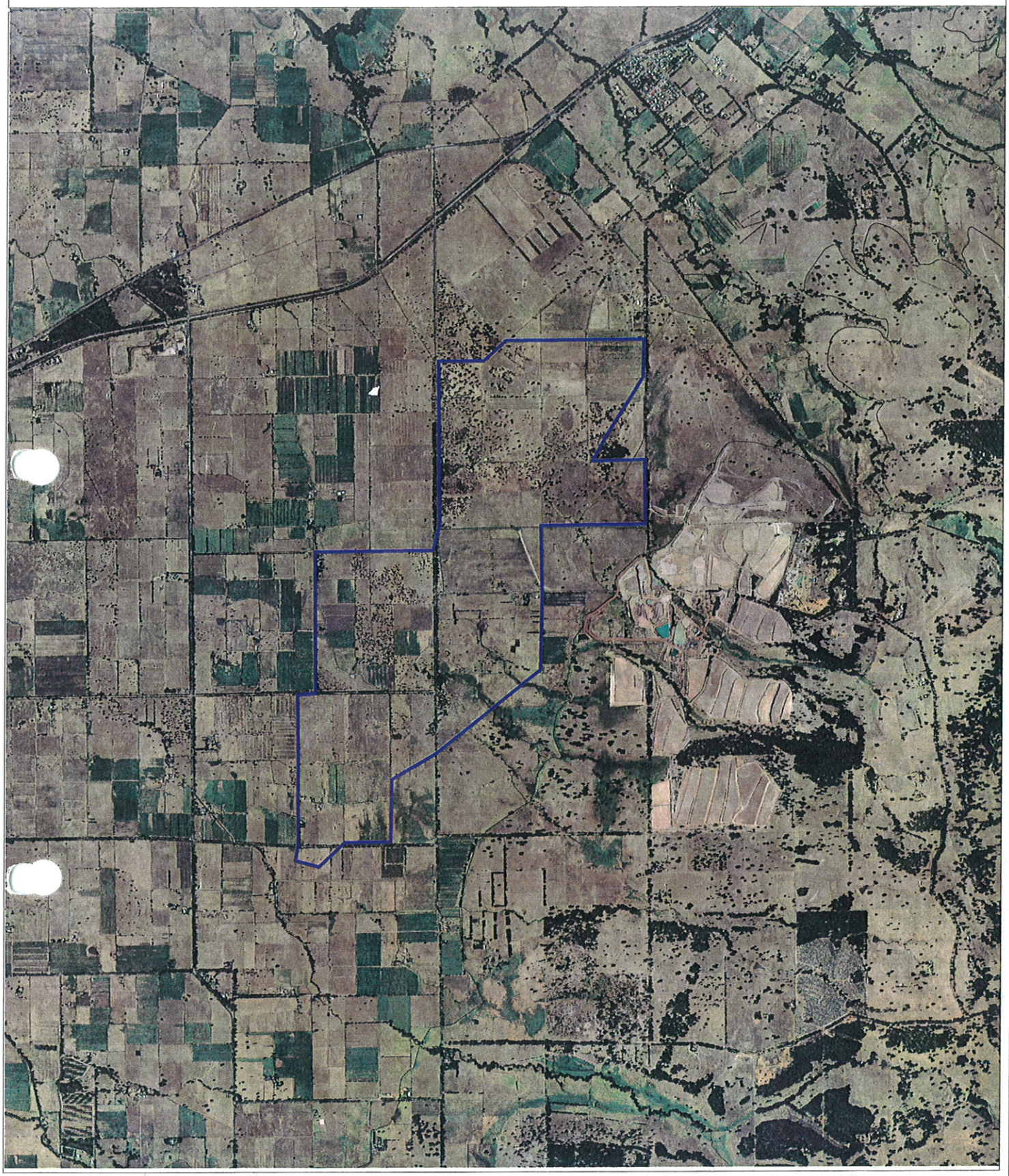
Burekup Mineral Sand Mine
CRN - 220852

Map Version: 1
Map Create Date: 22/02/2007
Map Created By: Euan Sutherland

8



Legend

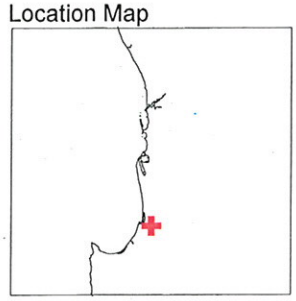
220852.shp

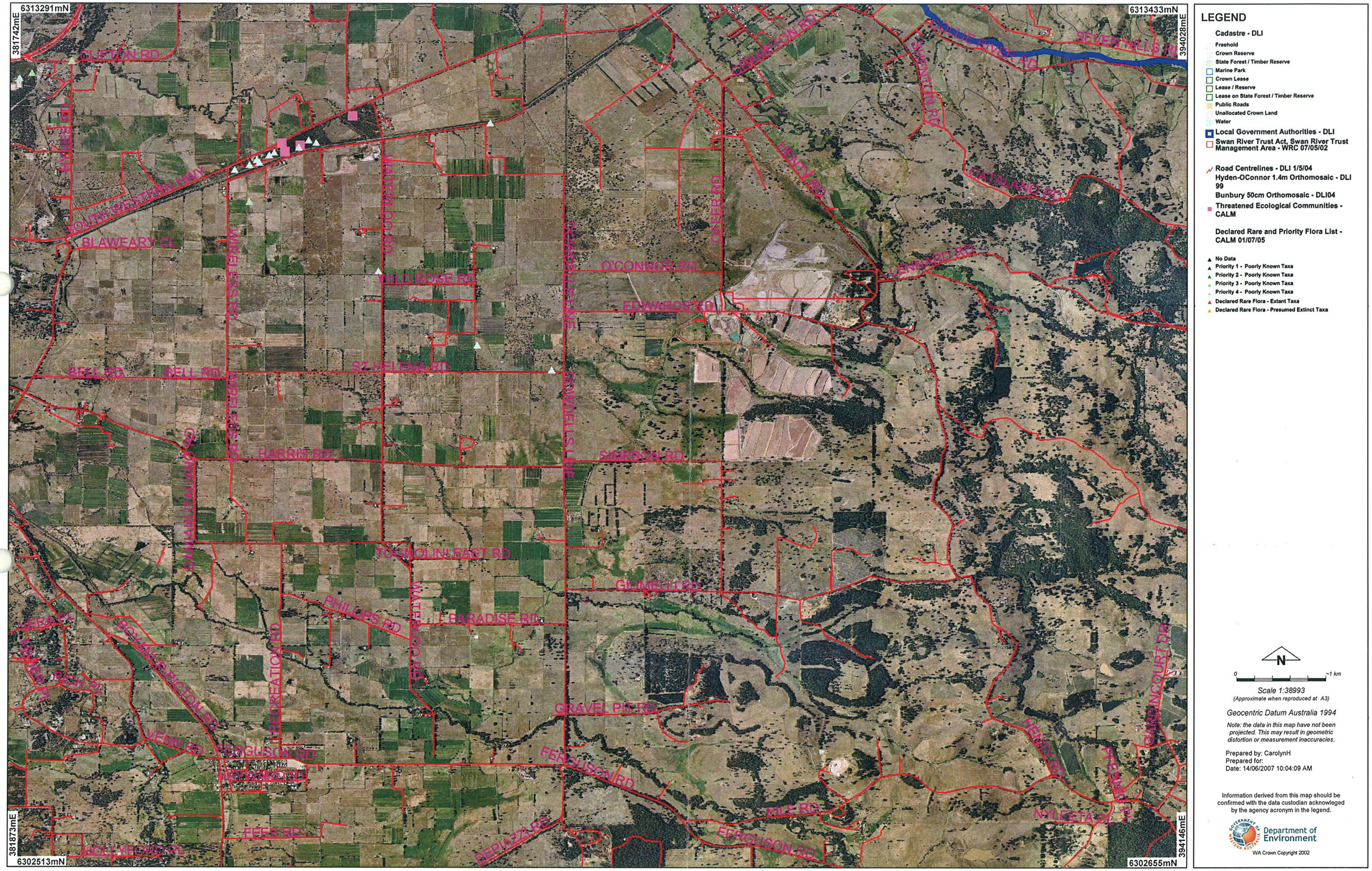
0 0.6 1.2 1.8 2.4 3 3.6 km

N

Projection: Map Grid of Australia Zone 50
Datum: Geocentric Datum of Australia, 1994
Scale: 1:40,000

Location Map




6313291mN
381742mE
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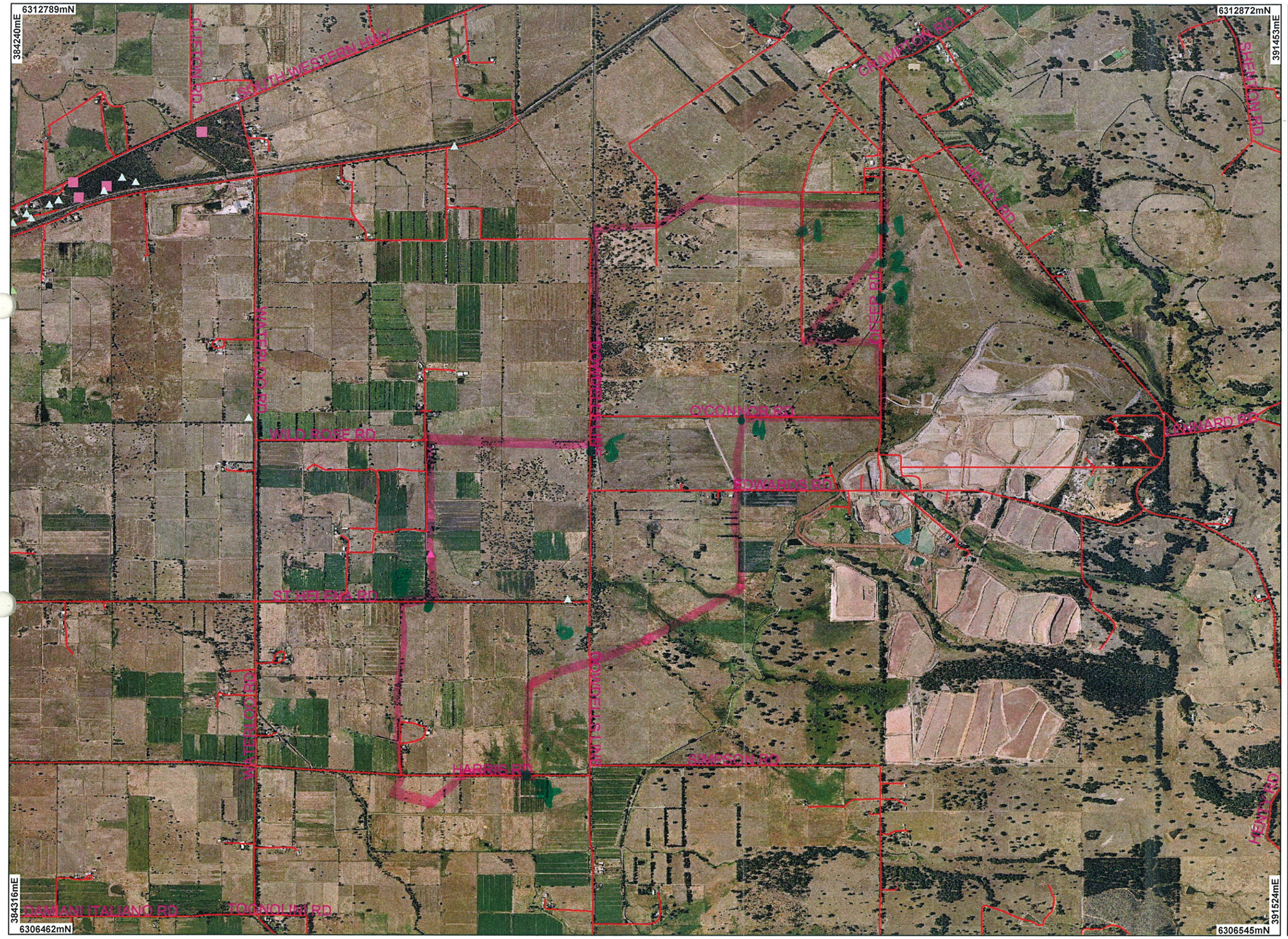
6302513mN
381873mE
6302655mN
394146mE
CLIFTON RD
SOUTH WESTERN HWY
BLAWEARY CL
WILD ROSE RD
O'CONNOR RD
EDWARDS RD
BELL RD
ST HELENA RD
HARRIS RD
SIMPSON RD
CATALANO RD
LENNARD RD
GUMELL RD
PHILIPS RD
PARADISE RD
GRAVEL PIT RD
FERGUSON RD
FEES RD
RILE RD
NYLEETA RD
LEGEND
Cadastre - DLI
Freehold
Crown Reserve
State Forest / Timber Reserve
Marine Park
Crown Lease
Lease / Reserve
Lease on State Forest / Timber Reserve
Public Roads
Unallocated Crown Land
Water
Local Government Authorities - DLI
Swan River Trust Act, Swan River Trust Management Area - WRC 07/05/02
Road Centrelines - DLI 1/5/04
Hyden-OConnor 1.4m Orthomosaic - DLI 99
Bunbury 50cm Orthomosaic - DLI04
Threatened Ecological Communities - CALM
Declared Rare and Priority Flora List - CALM 01/07/05
No Data
Priority 1 - Poorly Known Taxa
Priority 2 - Poorly Known Taxa
Priority 3 - Poorly Known Taxa
Priority 4 - Poorly Known Taxa
Declared Rare Flora - Extant Taxa
Declared Rare Flora - Presumed Extinct Taxa
N
0
~1 km
Scale 1:38993
(Approximate when reproduced at A3)
Geocentric Datum Australia 1994
Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.
Prepared by: CarolynH
Prepared for:
Date: 14/06/2007 10:04:09 AM
Information derived from this map should be confirmed with the data custodian acknowleged by the agency acronym in the legend.
Department of Environment
WA Crown Copyright 2002



LEGEND

Cadastre - DLI

- Freehold
- Crown Reserve
- State Forest / Timber Reserve
- Marine Park
- Crown Lease
- Lease / Reserve
- Lease on State Forest / Timber Reserve
- Public Roads
- Unallocated Crown Land
- Water

Local Government Authorities - DLI

Swan River Trust Act, Swan River Trust Management Area - WRC 07/05/02

Road Centrelines - DLI 1/5/04

Hyden-OConnor 1.4m Orthomosaic - DLI 99

Bunbury 50cm Orthomosaic - DLI04

Threatened Ecological Communities - CALM

Declared Rare and Priority Flora List - CALM 01/07/05

- No Data
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Poorly Known Taxa
- Declared Rare Flora - Extant Taxa
- Declared Rare Flora - Presumed Extinct Taxa

N

0 ~625 m

Scale 1:22894
(Approximate when reproduced at A3)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Prepared by: CarolynH
Prepared for:
Date: 14/06/2007 10:11:19 AM

Information derived from this map should be confirmed with the data custodian acknowleged by the agency acronym in the legend.

Department of Environment

Facsimile/Email Message

ENVIRONMENTAL PROTECTION AUTHORITY

EPA Service Unit

168 St Georges Terrace
PERTH WA 6000

Request for comments on attached Environmental Protection Statement Document

Proposal:	Burekup Mineral Sands Project
Assessment No:	
Level of Assessment:	Potential EPS
Contact Officer:	
Telephone:	(08) 6467 5412
Fax:	(08) 6467 5562
Email:	peter.walkington@dec.wa.gov.au
Pages (total):	
Date:	4 December 2007

BH received 10 Jan 08

An Environmental Protection Statement (EPS) document is required to describe the proposal and the receiving environment, outline the potential impacts of the proposal on factors of the environment, identify management strategies to protect environmental values, address the principles of environmental protection and demonstrate that the proposal is environmentally acceptable.

Could you please review the attached draft EPS and:

- identify potential environmental issues which you consider should be addressed in the EPS document, allocating a priority to each issue, in descending order of importance, together with your reasons;
- provide a suggested condition for each issue in relation to its proposed management;
- identify the appropriate government agency to manage the issue.

The EPASU will give attention to the input received from this targeted review and coordinate a response to the Proponent. Following the Proponent's incorporation of the comments, the EPA will finalise its decision on whether the level of assessment should be set at EPS, consider whether draft EPS document is acceptable for public review and prepare its report and recommendations for public release at the same time as the final EPS.

Your comments would be appreciated no later than close of business Friday, 14 December 2007. Please mark for the attention of the Assessment Officer noted above.

Policy & Coordination

Memorandum

TO: JAMES PEDERICK

FROM: TERRESTRIAL ECOSYSTEMS BRANCH

CC:

DATE: 15 JULY 2007

RE: BUREKUP MINERAL SAND MINE

FILE NO:

You asked for advice on whether information provided by the proponent in response to previous assessments of their referral form document has addressed our previous concerns.

VEGETATION AND FLORA, AND FAUNA

The commitment by the proponent to establish vegetation plots (as per EPA Guidance 51) and provide a plot based comparison with Floristic Community types for the Swan Coastal Plain is supported. This has been done in the Flora & Vegetation assessment

Some areas of vegetation in roadsides that contain dense trees and some native understorey in the north eastern part of the site appear to have been missed in the vegetation map of the site provided in the recent response to comments on the referral form. Many of the vegetation boundaries in the vegetation map provided in the original referral form of 2007 (Figure 1) differ from those in the vegetation map provided in the recent response to comments (Figure 1). These changes need to be explained. There is no explaination other than Mattiske Nov 2007 disturbed (fig 13) or completely degraded in the EPS.

The further consideration of the analysis of the proposed impacts on *Casuarina obesa* and *Eucalyptus wandoo* are supported. Our position, that stands of these species in this area of the Swan Coastal Plain are significant is maintained. The EPA concerns are noted 3.1 of the ~~Flora~~ Veg and Flora Mgt Plan.

The road verges within the site contain some areas of good condition (and some very good), and many other areas contain dense tree canopy. These areas are of value as fauna habitat, and many bird species have been observed using these trees. The comments provided by the proponent that such corridors do not 'have any significant value as an ecological linkage' and 'It is difficult to consider the degraded areas of remnant vegetation within this area of any local or regional significance' are refuted. In the largely cleared landscape of this area of the Swan Coastal Plain, areas of vegetation including these road corridors are of significance for fauna. In addition, Priority Flora species have been recorded in some of these roadside corridors, and their 'limited linkage to vegetated areas' does not diminish their value in providing habitat for such species. The 2006 vert fauna ass remains unchanged.

Given that no detailed fauna survey has been undertaken, as confirmed in the proponents response to the EPA letter 2 May 2007, there is no justification for the statement that 'there are no fauna habitats of particular significance within the Burekup Survey Area' as the data is not available to back up this statement. Similarly information and data are required to justify the statement '…It (road verge vegetation) does not have any significant value as an ecological linkage…'.

We concur the fauna survey (February 2006) was not conducted at an optimal time of year. The fauna report has not incorporated the 3 species of frog or the 8 species of bird identified in the Baseline Aquatic Biology Survey (November 2005) into the species list. This is despite stating that a literature search of published and unpublished information for the location had been undertaken.

'While Carnaby's Cockatoo may feed in the area it is considered unlikely, given the condition of the vegetation, that there would be any breeding in the Wandoo trees that remain in paddocks and roadsides.' This statement needs to be qualified. Table 17 of the EPS. now states

The statement 'A very low 16 reptiles are predicted to occur ...' is dismissive as the sixteen species might be a significant proportion of the number actually expected in the region. The report needs to state the expected reptile assemblage then the number of species identified following survey work and then determine what proportion of the expected assemblage has been found.

There is no mention of reptiles in the EPS.

* Do we want to do a site visit on Thurs when visiting the diesel plant. Note if yes then need extension to response time

ENVIRONMENTAL IMPACT ASSESSMENT DIVISION, MINING AND INDUSTRIAL BRANCH

INTRA-DEPARTMENTAL REQUEST FOR INFORMATION/ADVICE UNDER SECTION 38A(1)

TO: Gary Whisson – TEB (Attn: Carolyn Harding)

PROPOSAL: BUREKUP MINERAL SAND MINE

CRN: **CRN220852**

FROM: **James Pederick**

DATE OF REQUEST: 31/5/07

DATE ADVICE REQUIRED: 14/6/07

Carolyn / ~~Sue~~ John
Can we meet to discuss next Tuesday (12th) @ 2pm
JP

The above proposal has been referred to the EPA for assessment under the *Environmental Protection Act* 1986 (EP Act).

The EP Act requires the EPA to:

1. determine the significance of the effect on the environment of the proposal, if implemented, and
2. make a decision on whether or not to assess the proposal and, if the decision is to assess, also the level of assessment,

The EPA has determined that it does not have enough information about the Proposal to enable it to make a decision.

Accordingly, the EPA requests that Terrestrial Ecosystems Branch provide it with the following additional information about the proposal pursuant to section 38A of the EP Act.

Please note that EPA decision-making is subject to statutory timelines. Your response to this notice is required on or before 14 June. If you cannot respond within the time provided in this notice, or if you need further information, please advise me as soon as possible.

Information/advice requested

Advice was previously received from the Terrestrial Ecosystems Branch regarding this referral and additional information has been provided by the proponent. Please advise whether this information has addressed your previous concerns.

Reference Documents and location/access (e.g. TRIM)

Iluka's letter of response is enclosed which includes the response to comments previously made by your Branch.

File Ref Letter BU 070528 EPASU Comments on Burekup Mineral Sands Project Referral Form

28 May 2007

Chairman
Environmental Protection Authority
PO Box K822
Perth WA 6842

Attention: Tim Gentle/Ray Claudius

Dear Sir/Madam,

EPASU Comments on Burekup Mineral Sands Project Referral Form

Please find attached Iluka's response to your letter and comments dated the 2nd May 2007. This information is in addition to previous requests from the EPASU in relation to groundwater and acid sulfate soils.

Iluka still believes an EPS is an appropriate level of assessment for the Burekup project. Iluka now requests that a LOA be set in consideration of the additional information provided.

Please contact Brendan Bow on (08) 9360 4730 if you require any further clarification.

Yours Sincerely

MARK ADAMS
General Manager Western Region

While it is recognised that the majority of the site is extensively cleared of native vegetation, it is not possible to determine the potential significance of remaining native vegetation from the flora report. Thus, the information provided to date is inadequate to determine a level of assessment, given the possible Threatened Ecological Community (TEC) status of any remaining reasonably intact native vegetation in this area. Any native vegetation on the eastern side of the Swan Coastal Plain is regionally significant and as such any proposal impacting on the eastern side of the Swan Coastal Plain should require a formal level of assessment.

No vegetation within the disturbance area is considered reasonably intact and of sufficient quality to be considered a TEC. The community that is considered potentially a TEC is well outside the disturbance area. Iluka has acknowledged that the project requires a formal assessment hence the reason for the referral of the project to the EPASU.

EPA Guidance 10 for Level of Assessment for Proposals Affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region states that 'For those ecological communities where less than 10% remain, all areas are regionally significant, irrespective of the level of constraint on the land. Most communities in this category are communities typical of the eastern side of the Coastal Plain (principally the Pinjarra Plain), and all of these remnants are regionally significant under the Rarity criterion, most containing TEC.

As stated before the vegetation is degraded and therefore is unlikely to maintain its values. It is difficult to consider the degraded areas of remnant vegetation within this area of any local or regional significance. The photos as attached are indicative of the degradation (showing overstorey, but degraded understorey and grazing activities).

The flora survey undertaken for this project was conducted in December. This timing is not considered ideal in the South-west Botanical Province and therefore it cannot be categorically stated that the majority of the plant species in the project area were flowering, fruiting and had foliage that allowed for identification. Guidance No. 51 June 2004 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia states *"If the initial botanical survey is undertaken in non-optimal times, e.g. drought, supplementary surveys must be undertaken at optimal times."* This statement is supported in relation to this proposal.

The flora survey was conducted in December due to unseasonable climatic fluctuations. As per Guidance No. 51 the primary flora and vegetation survey should be conducted following the season which normally contributes the most rainfall in the bioregion. Within the South-West botanical province the highest season of rainfall is winter, however, unseasonably cool and wet spring weather was received in 2005 and as a result December was identified as still being within an optimal range for surveying at Burekup. Further, in the southern sections of the Swan Coastal Plain the spring season extends over several months as the conditions are cooler thereby allowing the annual species to persist.

Furthermore, botanical consultants from Mattiske Consulting Pty Ltd are very proficient in the identification of flora and vegetation within the South-West botanical province.

> Vegetation within the survey area, as defined by Heddle et al, falls within the Guildford vegetation complex, of which only 4.4% of the original extent remains on the Swan Coastal Plain within the Greater Bunbury Region, and only 0.4% is in existing and proposed Regional Open space. This is well below the 30% target for reservation of vegetation complexes occurring within the Greater Bunbury Region.

This is acknowledged in Section 2.3 (Mattiske, 2006).

> The flora report documents (p.11) a localised patch of *Corymbia calophylla* community (C4) that has floristic similarities to Community type SCP 3a, a TEC listed at both the State (Department of Environment and Conservation (2006c) and Federal levels (Department of the Environment and Heritage 2006b). The small patch of this community on the road verges of Simpson Road were ranked as "very good" and a plot based comparison made with the Floristic Community Types of the Swan Coastal Plain (Gibson et al) to confirm the conservation significance of this community and the remaining three community types in good condition, C1, C3 and M2.

Vegetation community C4 is located well outside of the planned disturbance limits as shown in Figure 1. The predicted change in piezometric head at vegetation community C4, located approximately 900 m from the disturbance area, is less than 1.0 m.

Iluka will commit to conducting a plot based comparison with the Floristic Community Types of the Swan Coastal Plain (Gibson et al) to confirm the conservation significance of this community and the remaining three community types in good condition. This assessment will be completed in Spring 2007.

> No vegetation plots were established during the survey of the area, and no species by community table, or species by plot table are provided within the flora and vegetation report. This makes it difficult to assess the potential Floristic Community Types, and therefore the potential TECs within the survey area. No photographs of vegetation have been provided in
>
> the report, which again makes it difficult to verify the condition and types of vegetation within the survey area.

Vegetation plots will be established in vegetation as described above. Photographs of the vegetation are attached.

The flora and vegetation report will be updated with plot information, species by community table, Floristic Community Type assessment and photographs for inclusion in the EIA document.

A Table summarising the total area of vegetation communities within the broader study area and within the defined disturbance area is included below and shown on Figure 1 attached. Note that this information has been updated from the disturbance area included within the February 2007 referral with the latest available project information. Within the disturbance area only 14.5 ha is condition 'good' or 'very good'.

Vegetation Community	Condition Rating	Within Study Area (ha)	Within Disturbance Area (ha)
A1	5	3.0	0
C1	4	1.5	0.7
	5	6.0	0
	6	10	0
C2	3	1.3	0.2
	4	8.0	2.0
	5	9.0	2.0
	6	0.8	0
C3	3	0.1	0.1
	4	3.0	0.7
	5	0.3	0.3
	6	0.6	0.3
C4	6	0.3	0
C5	4	1.5	1.5
	5	1.3	1.3
E1	4	0.10	0.10
	5	61.0	16.0
	6	2.5	1.3
M1	3	0.8	0.3
	4	3.5	3.4
	5	72.0	38.0
	6	6.5	3.5
M2	3	7.5	2.5
	4	3.7	3.0
	5	1.0	0.5
	6	1.0	1.0
Disturbed	3	1095	302
TOTAL		1302 ha	381 ha

The vegetation map in the flora and vegetation report should be provided as vegetation boundaries overlain on an aerial photo, so that local vegetation representation and linkages can be viewed in context.

An aerial photograph with vegetation boundaries is attached (Figure 1).

The flora and vegetation report mentions that one type of TEC is known to occur within the area, however there are two TECs in close proximity to the site; 3c and 8. In addition, the report lists the TECs found in the 'general Capel area'; it is unclear why these are listed when there is at least one TEC closer to the site that have not been mentioned.

The flora and vegetation report will be updated with information pertaining to TEC's 3c and 8. These communities are located 2.6 km and 2.8 km and are outside both the disturbance area and groundwater drawdown area (see attached Figure 2).

The flora and vegetation report does not list the species of Declared Rare and Priority flora that were recorded for the database search area, nor does it state the dimensions of the database search area. It is unclear which Declared Rare and Priority species were searched for, or which were considered likely to occur within the survey area.

A Declared Rare and Priority flora database search was conducted for the wider Southern Swan Coastal Plain. Constant referencing with Florabase was also conducted.

All DRF and PF species were searched for not just those that were identified in the database search and Florabase. New species and rare flora are regularly located during surveys by Mattiske Consulting Pty Ltd.

The *Casuarina obesa* within the site is the most southern extent of this species known on the eastern side of the Swan Coastal Plain, and is therefore of significance. In addition, the stand of *Eucalyptus wandoo* within this site is one of the most extensive known stands of mixed aged, this far south on the Pinjarra Plain. Retention of these areas of vegetation should be considered.

Within the study area *Casuarina obesa* occurs in vegetation community C3. Of the 4 ha of this community recorded only 1.4 ha of varying condition is within the disturbance area as outlined in the following table.

Community	Condition Rating	Within Study Area	Within Disturbance Area
C3	6 (completely degraded)	0.6 ha	0.3 ha
	5 (degraded)	0.3 ha	0.3 ha
	4 (good)	3.0 ha	0.7 ha
	3 (very good)	0.1 ha	0.1 ha
Total		4.0 ha	1.4 ha

Within the study area *Eucalyptus wandoo* occurs within vegetation communities C1 and E1. Of the 81.1 ha of these communities recorded within the study area only 0.8 ha of 'good' condition vegetation is within the disturbance area as outlined in the following table.

Community	Condition Rating	Within Study Area	Within Disturbance Area
C1	6 (completely degraded)	10 ha	0 ha
	5 (degraded)	6 ha	0 ha
	4 (good)	1.5 ha	0.7 ha
E1	6 (completely degraded)	2.5 ha	1.3 ha
	5 (degraded)	61 ha	16 ha
	4 (good)	0.1 ha	0.1 ha
Total		81.1 ha	18.1 ha

The EIA document will incorporate a complete analysis of these impacts and discussion regarding mitigation and management measures. Offsets for these areas will be considered in accordance with EPA Position Statement 9.

The timing of this flora survey would not have identified the Declared Rare Flora (DRF) species *Drakea Micrantha*, which flowers September to October and may be found in the project area.

The flora survey was conducted in December due to unseasonable climatic fluctuations. As per Guidance No. 51 the primary flora and vegetation survey should be conducted following the season which normally contributes the most rainfall in the bioregion. Within the South-West botanical province the highest season of rainfall is winter, however, unseasonably cool and wet spring weather was received in 2005 and as a result December was identified as still being within an optimal range for surveying at Burekup. Further, in the southern sections of the Swan Coastal Plain the spring season extends over several months as the conditions are cooler thereby allowing the annual species to persist.

The road verges within the area appear to contain some vegetation in Very Good condition (Figure 2). Are these road verges proposed to be reserved, particularly considering their capacity to provide linkage? The proponent should discuss the vegetation contained in the road side reserves with the Shire of Dardanup.

The road verges are not proposed to be reserved and have limited linkage to vegetated areas. Discussions have commenced with the Shire of Dardanup regarding the project.

The presence of *Corymbia haemotoxylon* within the site (Appendix A, Mattiske 2006) also requires investigation, as this species could be considered a disjunct and significant population.

Within the study area *Corymbia haemotoxylon* is restricted to vegetation community C5. All areas of community C5 (1.8 ha) are greater than 500 m outside of the disturbance area.

The fauna report provided, despite its claim that it conforms with a Level 2 Detailed Survey in accordance with EPA Guidance Statement No. 56, is no more than a Level 1 survey which presents little data on the fauna actually present. It should emphasise that only a brief reconnaissance survey and limited desktop survey has been undertaken, therefore the significance of the area is poorly known. The role of the vegetation as part of an ecological linkage has not been considered adequately.

The fauna report will be updated to clearly stipulate that a Level 1 survey was conducted.

The fauna report clearly states in Section 5.7 that "there are no fauna habitats of particular significance within the Burekup Survey Area," and "there is little remnant vegetation in Very Good condition, with only very small areas of road verge vegetation being in this category. Most of the Survey Area is completely cleared or has unfenced remnant vegetation in a mosaic of Good to Degraded condition."

Section 5.8 goes on to discuss that "there are no significant corridors of vegetation within the Survey Area." The road verge vegetation is remnant vegetation that will allow the movement of small birds; however, it does not form a link between any areas of ungrazed bushland (Ninox, 2006). It does not have any significant value as an ecological linkage and is mainly sparsely vegetated with native vegetation and heavily populated with weeds.

The limitation of the fauna survey is reflected in the fact that no reptile, frog or mammal species were recorded. However it is noted that the consultants undertaking the 'Baseline Aquatic Biology and Water Quality Study' identified 3 species of frog during survey work.

A detailed faunal survey to the level expected for a level 2 survey to satisfy EPA's expectations in Guidance 56 should be undertaken so the proposal can be appropriately assessed.

The 'Baseline Aquatic Biology Survey' was conducted in spring (November 2005) which is more optimal for amphibian activity than when the "Fauna Survey" was conducted (February 2006). Four frog species were listed in Ninox, 2006 as predicted to occur following the literature review and WA Museum database search.

The project area contains stands of *Eucalyptus wandoo (wandoo)*. Carnaby's Cockatoo, which is listed as Endangered under the *EPBC (1999) Act* and Vulnerable under the *WCA (1950)* is known to breed in the hollows of Wandoo and may occur within the Burekup survey Area. It is also possible that Marri (*Corymbia calophylla*) trees will provide some food resources to Carnaby's.

While Carnaby's Cockatoo may feed in the area it is considered unlikely, given the condition of the vegetation, that there would be any breeding in the Wandoo trees that remain in paddocks and roadside. It was noted in the Ninox report that no individual Marri trees were noted that showed signs of habitual feeding by Carnaby's Cockatoos (Jan Henry pers comm.).

The report states 'A very low 16 species of reptile are predicted to occur in the habitats of the Survey Area'. What is the basis for this statement ? It should be referenced.

This statement is based on other surveys within the region. Given the 19 species of reptile that were recorded at Yoganup 215 after trapping by Biota Environmental Sciences within vegetation in very good condition, it is unlikely that more species would be recorded in degraded road verge and paddock vegetation. Therefore, the 16 species noted in the Ninox report as potentially occurring in the area is a 'best case scenario' result.

The role that the remnant vegetation plays in the project area as an ecological link has not been adequately assessed. Given the paucity of remnant vegetation in this area it is likely that all remnant vegetation plays a function as an ecological link in this area and information should be provided in this regard.

Refer to previous comments on remnant vegetation and ecological linkages

The invertebrate assemblages of the Burekup Project Area are considered tolerant of a wide range of environmental conditions and are common, ubiquitous and frequently encountered in freshwater systems within Western Australia. Of note, however, was the collection of a number of microcrustaceans, the Rotifers *Dicranophoroides caudatus* and *Filinia cf. passa* from site B3 which were the first records of these species in Western Australia, and the indeterminate Difflugiidae Rhizopod, which is likely a new species to science. Also of note was the Plecoptera *Newmanoperla exigua* recorded from Henty Brook (B8). These stoneflies are endemic and restricted to the far southwest corner of the State and are typically regarded as ecologically significant, owing to their high sensitivity to water quality. Two species collected from Burekup represent extensions to their known ranges; the Hydrophild beetles *Enochrus samae* and *Berosus gibbae*. Finally, two introduced species were recorded during the current study, the gastropod *Lymnaea stagnalis*, and the Simulid (black-fly larva) *Simulium ornatipes*.

Groundwater drawdown influences on the conservation-category and resource-enhancement wetlands are predicted to be very brief with mining in adjacent pits restricted to two months at the end of the project. Predicted lower of hydraulic head at these wetlands is displayed in the groundwater modelling report provided previously.

Groundwater levels will be monitored monthly across the groundwater monitoring network. Drawdowns beneath the wetlands are predicted towards the end of mining which will enable regular review of predicted drawdown to actual drawdown.

A vegetation and wetland assessment has been completed and further details will be provided in the EIA document. Soil studies are currently being conducted and once complete will allow for an assessment of sensitivity to predicted drawdown. Given the limited nature of the drawdown and the conservative assumptions employed in the model there are not anticipated to be significant impacts to either wetland.

Time and budgetary constraints meant the existence of permanent pools in the Henty Brook over summer has not been ascertained. If present, larger pools are likely to provide dry season refuge for fish and crayfish and should be maintained. Spatial extent of dewatering drawdown should be determined through groundwater modeling relative to any summer refuge pools. Ecological values should be considered in the development of an Ecological Water Requirement (EWR) assessment.

Henty Brook is outside of the predicted maximum area of groundwater drawdown and therefore will not be impacted by the project.

The document does not examine the hydrology of dry and wet phases of seasonal wetlands needed to maintain the biodiversity. The patterns/timing of wetting and drying cycles should be determined for the area to ensure they are not significantly altered as a consequence of mine dewatering.

As discussed above.

The referral form has not provided sufficient justification that the proposed mineral sands mine and associated activities will not impact the values of the wetlands within the study area.

The following potential impacts and issues resulting from the proposed sand mine require further investigation.

- Hydrological characteristics of the area (e.g. comprehensive discussion of the hydrological connectivity of the wetlands in the area)
- Altered geomorphology of the study area (e.g. potential impacts to drainage patterns, and cumulative impacts to the catchment)
- Wetland buffers (e.g. detailed justification that the proposed buffers will protect the values of the wetlands from the proposal)
- Mitigation options to reduce the impacts of the proposal on the wetlands (e.g. water management plan)
- Options for the rehabilitation of protected wetlands and their buffers (e.g. UFI 2362, UFI 2165 and any other wetland not to be mined) to offset potential impacts to wetland values.

Hydrological investigations have been undertaken and submitted separately to the EPASU. Further management and mitigation measures will be addressed in the EIA document.

The majority of the study area (delineated in Figure 3 of the EPA Referral Form) is identified in the *Geomorphic Wetlands Swan Coastal Plain* dataset (the dataset) as an extensive palusplain (i.e. seasonally waterlogged flat). There are also a few small sumplands and damplands located within the palusplain. The wetlands within the study area have been largely identified as Multiple Use category with the exception of one sumpland (Conservation category UFI 2362) and one dampland (Resource Enhancement category UFI 2165).

Noted.

Wetland Research & Management (2006) have provided incorrect wetland types for some of the sample sites. The correct classification (as identified on the dataset) for the wetlands sampled by WRM (2006) are as follows:
Site no. 1 – sumpland (UFI 2362)
Site no. 2 – palusplain (UFI 13244)
Site no. 3 – palusplain (UFI 13244)
Site no. 4 & 5 – dampland (UFI 2165)
Site no. 9 – palusplain (UFI 13244)

WRM (2006) have suggested that sites 2,3 and 9 are discrete wetlands, however, it should be noted that sites 2, 3 and 9 are all identified as part of the same extensive palusplain (UFI 13244) and may be hydrologically connected.

WRM acknowledges that better choice of descriptive terms for the sites, other than "seasonal wetland" and "dampland", should have been made given their landform and hydroperiod connotations. The intent was not to categorise wetland type as defined by Hill et al. (1996) as the current extent of seasonal inundation and hydraulic connectivity could not be determined within the scope of the study and are likely to be highly altered from the natural condition as evidenced by extensive agricultural drain networks. Sites were assessed as individual units of larger likely interconnected wetlands with poorly defined boundaries in accord with Part IIB of the EPA Bulletin 686 Questionnaire. The individual units/sites assessed were described as well-defined on the basis of remnant vegetation associations (primarily paperbark overstorey species) and not hydraulic connectivity.

It is noted that WRM (2006) have evaluated the wetlands within the study area using EPA Bulletin 686 Questionnaire (1993) and have indicated that the management category for the studied sites should be Multiple Use. EPA Bulletin 686 Questionnaire is acknowledged as a method of assisting in the determination of wetland management categories but is also recognised as being focused on wetlands with open water bodies. In assessing wetland evaluation, DEC considers the results of EPA Bulletin 686 Questionnaire within the context of all available information, but not as the sole determinant of a wetland management category. In addition, requests to modify wetland management categories or wetland boundaries should be submitted to the DEC Wetlands Program Coordinator, in accordance with *Protocol for proposing modifications to the 'Geomorphic Wetlands Swan Coastal Plain' dataset* (DEC 2007). The information provided in *Burekup Mineral Sands Project Referral Form* (Iluka 2007) is not in accordance with *Protocol for proposing modifications to the 'Geomorphic Wetlands Swan Coastal Plain' dataset* (DEC 2007) and therefore the management categories as identified in the dataset will not be modified.

WRM's assessment used the EPA Bulletin 686 Questionnaire recommended at the time by the (then) Water & Rivers Commission as a method of assisting in the determination of wetland management categories. WRM acknowledge in their report that Bulletin 686 is limited in its application, in particular "because it doesn't adequately make allowance for floristic complexity, vegetation density, vegetation health and condition, and/or less conspicuous fauna" and that the methodology for assessing wetland systems was currently being revised. New guidelines for assessment are still under revision (DEC 2007).

However, the scope of WRM's study did not include re-classification of the wetlands, merely evaluation of their current state. WRM's recommendation based on acknowledged limited criteria was that current wetland management codes may be inappropriate given the severely degraded nature of the understorey vegetation, poor water quality, likely modified hydrology due to drain construction and current

agricultural land-use practices, and that the further investigation was warranted (WRM 2006b).

> It should be noted that some wetland areas appear to have higher values than have been recognised in the dataset. For example, one area of Multiple Use palusplain (site 3), is identified as containing rare species of microinvertebrates and another (site 2) is identified with a vegetation condition rating of 'Very Good' (Government of Western Australia 2000). Wetland areas of high value should be acknowledged and the potential impacts and mitigation measures discussed. Based on the new information provided in *Burekup Mineral Sands Project Referral Form* (Iluka 2007) a request to modify the dataset should be submitted in accordance with *Protocol for proposing modifications to the 'Geomorphic Wetlands Swan Coastal Plain' dataset* (DEC 2007).

WRM consider that while some of the aquatic invertebrate species recorded from Burekup are south-west endemics, none are restricted to the Burekup wetlands. Nor are the species recorded as new to WA likely to be restricted to the Burekup wetlands. Russell Shiel (University of Adelaide), one of Australia's foremost experts on aquatic microinvertebrates, conducted the taxonomic identifications for the Burekup microfauna. His comments on their conservation status are as follows:

i). The rotifer *Dicranophoroides caudatus* is known from 6,500 localities world-wide but to date has been recorded from only six sites within Australia. It may therefore be considered one of the rarest of the Dicranophoridae, and possibly has stringent habitat requirements. However, given the distribution of the six sites - billabongs at Jabiluka, NT, billabongs of the Murray River at Wodonga, Vic, the Goulburn River at Alexandra, Vic, and now at Burekup, WA - it is probable that the species is pancontinental. It is likely that *D. caudatus* has not been recorded often in Australia due to limited sampling effort (microinvertebrates historically have been less studied than macroinvertebrates) and mistaken identification. Due to this under-sampling, it is also not uncommon to produce records of new taxa.

ii). The rotifer *Filinia cf. passa* is also likely pancontinental. There are at least 20 verified records from all states, except Tasmania. It too is under sampled/mis-identified.

iii). The indeterminate difflugiid could not be relegated with confidence to any described taxon, therefore on probability is undescribed, given the low level of research on testate Rhizopoda in Australia generally and WA specifically. Whether it is more widely distributed is unknown given the lack of attention paid to this protist group. It is likely that it is more widely distributed in comparable habitats, but has yet to be recorded.

It should be stressed that a 'one-off 'sample of invertebrates from any wetland will produce a species list which is effectively a 'snapshot' of that time and place. Therefore, re-sampling the same wetland at another time will likely produce a different set of taxa. The microfauna in particular are cued to natural cycles, with emergence from resting stages dependent on the cues to which they are 'tuned', such as day-length, chemistry, temperature, algal exudates or prey hormones. The speed of these microinvertebrate species replacements can be in hours or days (cf. Tan & Shiel 1993, for billabong microfauna in eastern Australia). Thus, it follows that the microinvertebrate species recorded from the Burekup wetlands on the sampling date will be replaced by another set of species the following week(s) and season(s), most of which on probability are likely to be known taxa, but a proportion of which (commonly 10-15%) are likely to be unknown.

The condition of all sites was considered degraded due to historic pastoral practices and unrestricted livestock access to the natural waterbodies. Even the conservation category wetland (UFI 2362) is currently used for cattle grazing. While agricultural drain construction has significantly reduced the size of natural seasonal wetlands, damplands and palusplains, clearing has likely resulted in increased overland flows and rising water tables. Aquatic fauna communities at all sites were dominated by cosmopolitan species, typical of lowland rural regions.

Iluka (2007) state that the Conservation category sumpland (UFI 2362) and Resource Enhancement dampland (UFI 2165) will be protected with a 50m buffer, however, justification that 50m is sufficient to protect the wetlands from the proposal has not been provided. It is noted that the pit void will be located 200m from the Conservation category sumpland and 500m from the Resource Enhancement dampland, however, Figure 6 shows that the buffer of the Conservation category sumpland and the entire Resource Enhancement dampland and buffer is within the 'disturbance limits'. The meaning of 'disturbance limits' should be provided and it is also recommended that the pit void is illustrated on Figure 6.

Buffer limits will be decided in consultation with DOW. The conservation-category wetland is located greater than 100 m outside the disturbance area and the resource enhancement wetland is located greater than 300m outside of the disturbance area. The 'disturbance limits' or 'disturbance area' are the maximum expected area covered during mining. This includes all mining pits and infrastructure. See attached Figure 3 showing the two wetlands in relation to the disturbance area and mine pits.

Hydrological investigations have been forwarded to the EPASU which show the expected changes in hydrology due to pit dewatering.

Wetlands that are to be conserved require a buffer to protect them from potential adverse impacts and, maintain ecological processes and functions within the wetland. The width of the buffer should be determined based on the values of the wetland to be protected and the threats posed by the adjacent land use (50m being the *minimum* buffer distance applied). Wetland buffers should be determined in accordance with *Water and Rivers Position Statement: Wetlands* (WRC 2001) and EPA Draft Guidance Statement No. 33 *Environmental Guidance for Planning and Development* (EPA 2005). In addition, the information contained within the draft *Guideline for the Determination of Wetland Buffer Requirements* (by Essential Environmental Services (2005) for the Department for Planning and Infrastructure), should be considered.

As above.

It is noted that studies on the hydrology of the area have not been undertaken by the proponent. The hydrological connectivity between wetlands is complex and therefore impacts to one area of wetland may potentially impact another area of the same wetland, or another wetland outside of the initial impact site (e.g. direct impacts to an area of palusplain may potentially result in indirect impacts to a distant sumpland). The open pit mining proposal will result in a significant change to the geomorphology of the study area and may potentially impact surface water and groundwater flows to wetlands. Any alteration to a wetland's hydrological regime, may result in adverse impacts to the values of the wetland (e.g. flora and fauna).

Hydrological investigations have been undertaken and submitted separately to the EPASU.

Burekup Vegetation Types – Photos

A1: Woodland of *Agonis flexuosa – Corymbia calophylla – Eucalyptus rudis* over weeds on loam soils along flowlines.

C1: Woodland of *Corymbia calophylla – Eucalyptus wandoo* over *Xanthorrhoea preissii, Hypocalymma angustifolium* and weeds on sandy-loam soils.

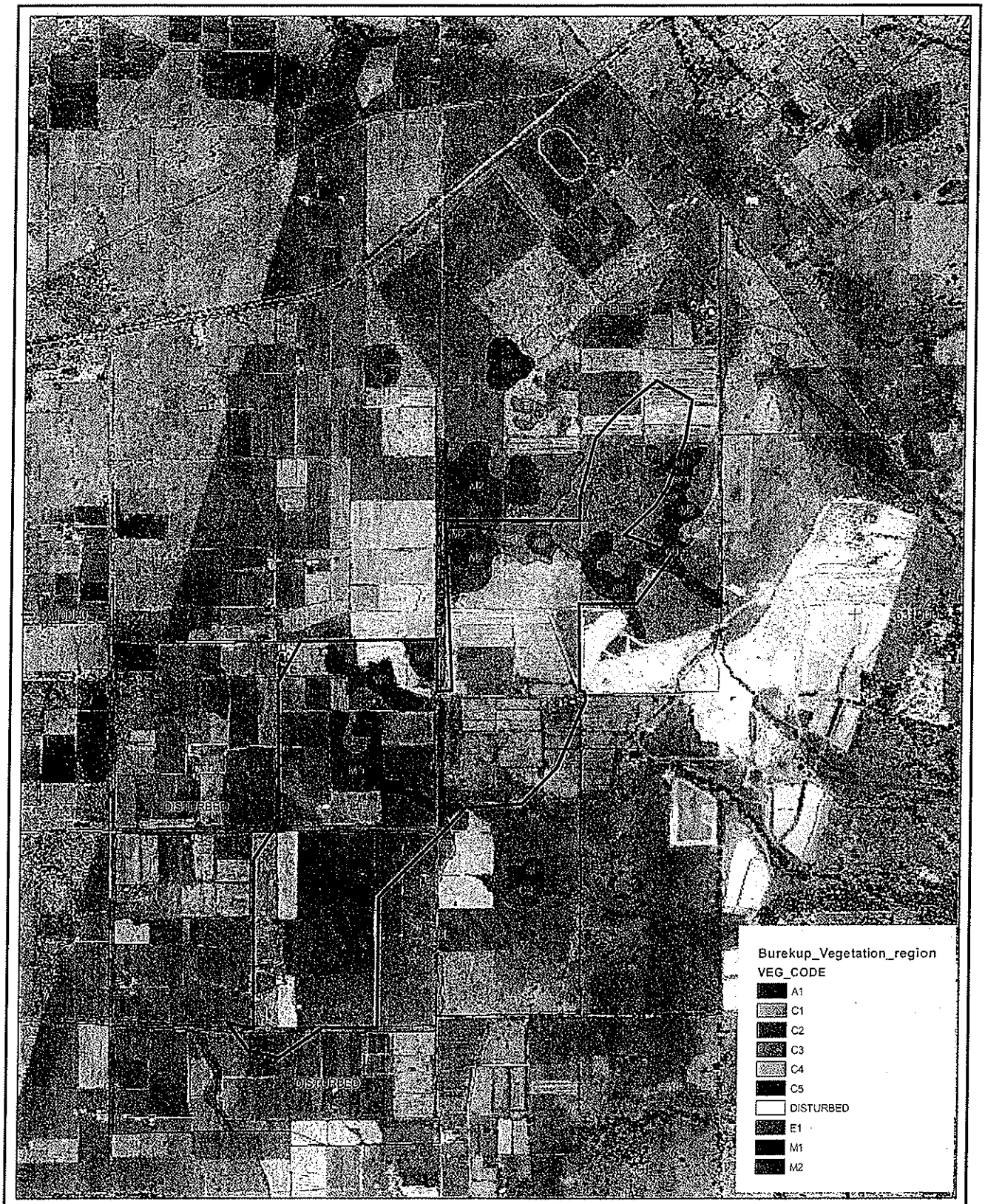
C2: Woodland to forest of *Corymbia calophylla – Eucalyptus rudis – Melaleuca rhaphiophylla – Melaleuca preissiana* over weeds on loam soils.

C3: Low woodland of *Casuarina obesa* over *Melaleuca viminea subsp. viminea* and *Hakea varia* over *Chorizandra enodis* on sandy-loam soils.

E1: Woodland of *Eucalyptus wandoo* over *Melaleuca rhaphiophylla* over pasture on loam soils.

M1: Low woodland to forest of *Melaleuca rhaphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils.

M2: Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateritia, Viminaria juncea, Acacia saligna* and *Hakea varia* over *Lepidosperma longitudinale* on clay-loam soils.



N

500 0 500 m

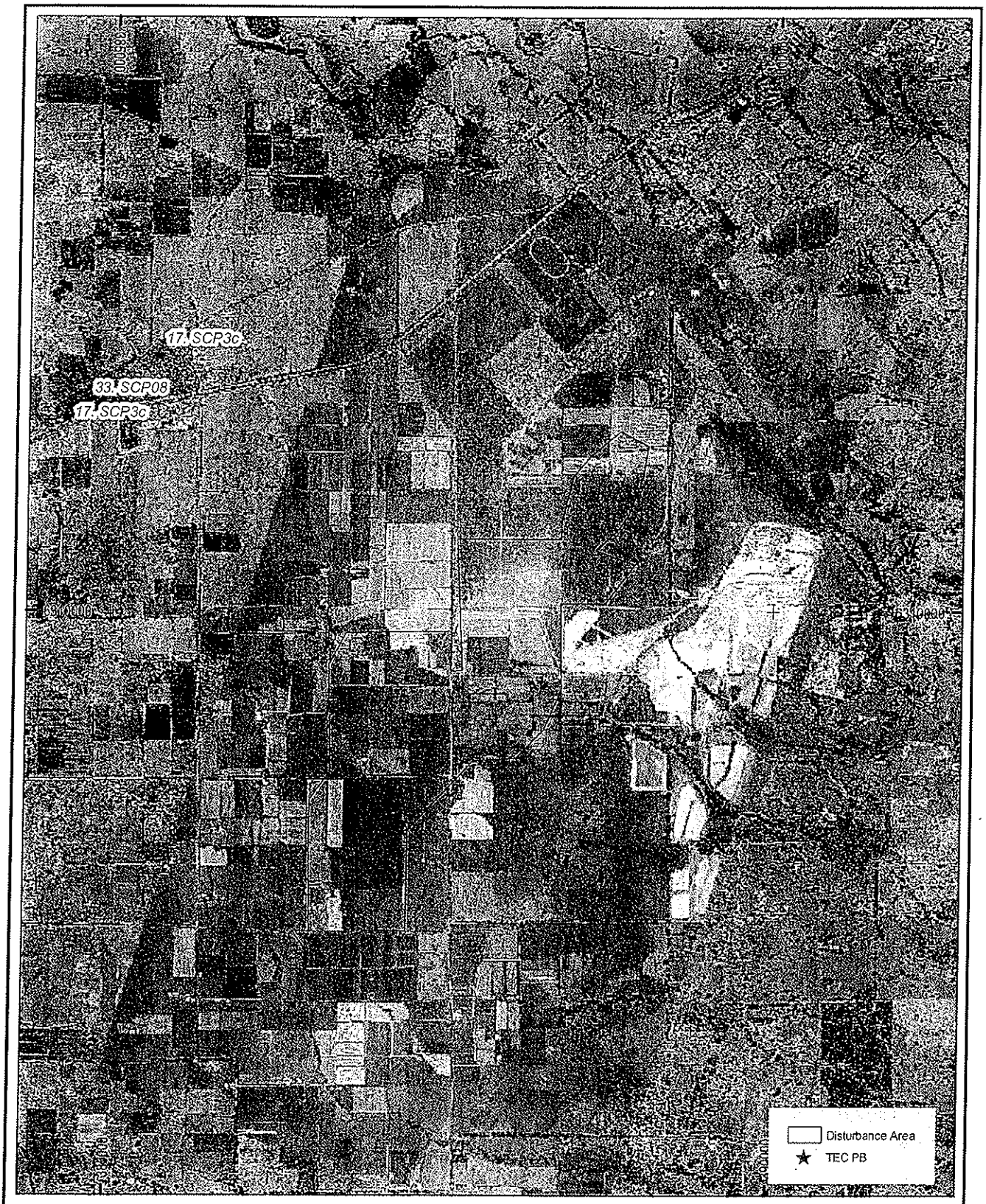
MGA Coordinates, GDA94

ILUKA

BUREKUP

VEGETATION MAPPING OVER AERIAL PHOTO

ORIG: LS			
DRAWN: LS			
SCALE: 1:31,019			
DATE: 18/5/2007	DWG No: APJ BU Veg Mapping over Aerial	A4	FIGURE: 1



N

500 0 500 m

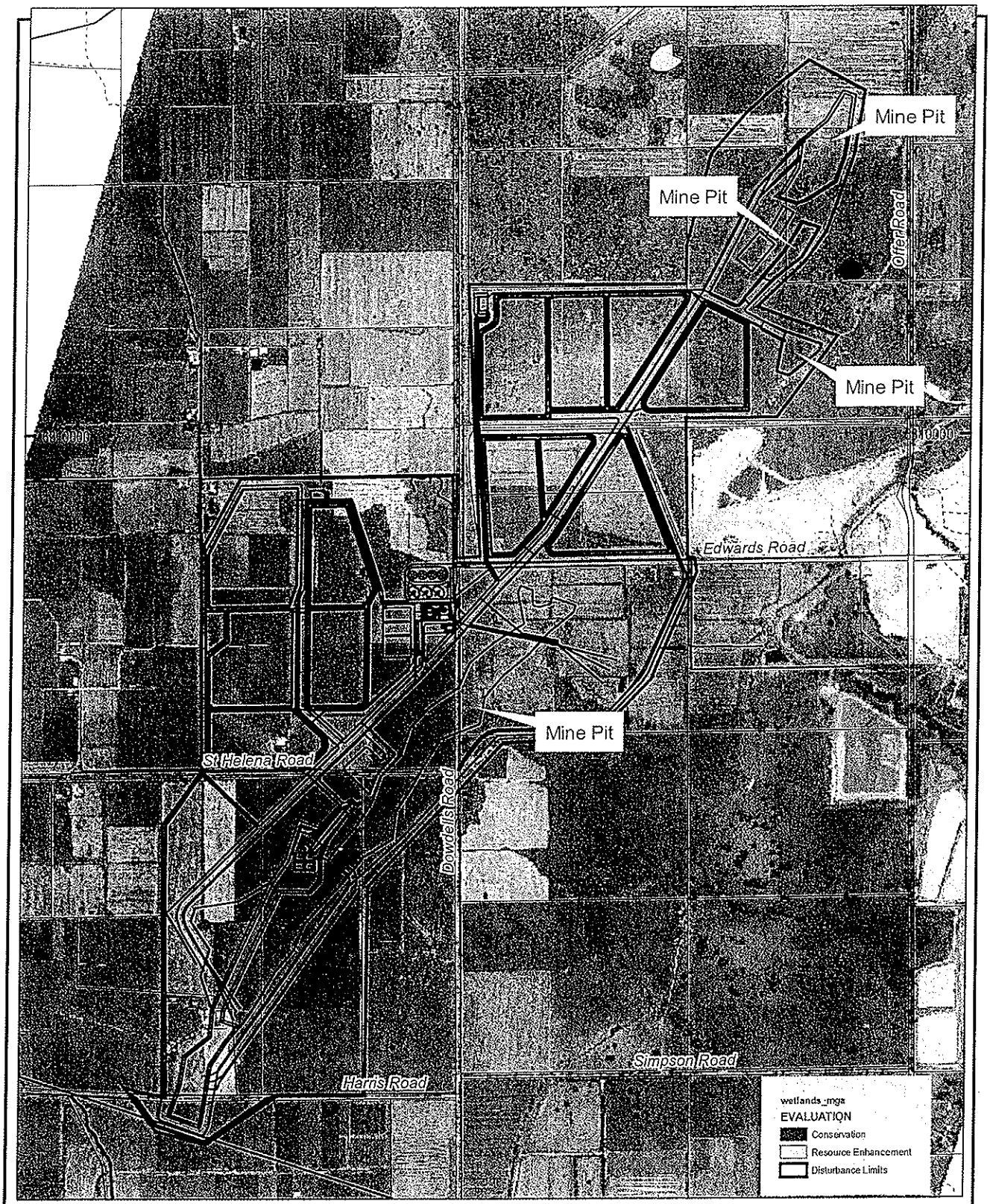
MGA Coordinates, GDA94

ILUKA

BUREKUP

TEC LOCATIONS

ORIG: LS				
DRAWN: LS				
SCALE: 1:40,000				
DATE: 18/5/2007	DWG No: APJ BU Veg Mapping over Aerial	A4	FIGURE: 2	



N

500 0 500 m

MGA Coordinates, GDA94

ILUKA

ORIG:	Orig
DRAWN:	Drawn
SCALE:	1:19,508
DATE:	Date

BUREKUP

WETLANDS

DWG No: DRAFT | A4 | FIGURE: 3

Memorandum

TO: JAMES PEDERICK

FROM: TERRESTRIAL ECOSYSTEMS BRANCH

CC:

DATE: 26 MARCH 2007

RE: BUREKUP MINERAL SAND MINE

FILE NO:

While it is recognised that the majority of the site is extensively cleared of native vegetation, it is not possible to determine the potential significance of remaining native vegetation from this report. Thus, the information provided to date is inadequate to determine a level of assessment, given the possible TEC status of any remaining reasonably intact native vegetation in this area. Any native vegetation on the eastern side of the Swan Coastal Plain is regionally significant and as such any proposal impacting on the eastern side of the Swan Coastal Plain should require a formal level of assessment.

EPA Guidance 10 for Level of Assessment for Proposals Affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region states that 'For those ecological communities where less than 10% remain, all areas are regionally significant, irrespective of the level of constraint on the land. Most communities in this category are communities typical of the eastern side of the Coastal Plain (principally the Pinjarra Plain)...All of these remnants are regionally significant under the Rarity criterion, most containing threatened ecological communities.'

VEGETATION AND FLORA

Vegetation within the survey area falls within the Guildford vegetation complex, of which only 4.4 % of the original extent remains on the Swan Coastal Plain within the Greater Bunbury Region, and only 0.4% is in existing and proposed Regional Open space. This is well below the 30% target for reservation of vegetation complexes occurring within the Greater Bunbury Region.

The *Casuarina obesa* within the site is the most southern extent of this species known on the eastern side of the Swan Coastal Plain, and is therefore of significance. In addition, the stand of *Eucalyptus wandoo* within this site is one of the most extensive known stands of mixed aged, this far south on the Pinjarra Plain. Retention of these areas of vegetation should be considered.

The flora and vegetation survey was undertaken in summer (December 2005), which was inappropriate for this region. EPA Guidance 51 states that 'if the botanical survey is undertaken in non-optimal times...supplementary surveys must be undertaken at optimal times.

No vegetation plots were established during the survey of the area, and no species by community table, or species by plot table are provided within the flora and vegetation report. This makes it difficult to assess the potential Floristic Community Types, and therefore the potential Threatened Ecological Communities (TECs) within the survey area. No photographs of vegetation have been provided in the report, which again make it difficult to verify the condition and types of vegetation within the survey area.

The flora and vegetation report mentions that one type of TEC is known to occur within the area, however there are two TECs in close proximity to the site; 3c and 8. In addition, the report lists the TECs found in the 'general Capel area'; it is unclear why these are listed when there is at least one TEC closer to the site that have not been mentioned.

The flora and vegetation report does not list the species of Declared Rare and Priority flora that were recorded for the database search area, nor does it state the dimensions of the database search area. It is unclear which Declared Rare and Priority species were searched for, or which were considered likely to occur within the survey area.

The tree canopy within the area could provide good habitat for fauna, and vegetation within the site may provide ecological linkage within the area. The vegetation map in the flora and vegetation report should be provided as vegetation boundaries overlain on an aerial photo, so that local vegetation representation and linkages can be viewed in context.

The road verges within the area appear to contain some vegetation in Very Good condition (Figure 2). Are these road verges proposed to be reserved, particularly considering their capacity to provide linkage?

The presence of *Corymbia haemotoxylon* within the site (Appendix A, Mattiske 2006) also requires investigation, as this species could be considered a disjunct and significant population.

FAUNA

The fauna report provided, despite its claim that it conforms with a Level 2 Detailed Survey in accordance with EPA Guidance Statement No. 56, is no more than a Level 1 survey which presents little data on the fauna actually present. It should emphasise that only a brief reconnaissance survey and limited desktop survey has been undertaken, therefore the significance of the area is poorly known. The role of the vegetation as part of an ecological linkage has not been considered adequately.

The limitation of the fauna survey is reflected in the fact that no reptile, frog or mammal species were recorded. While it is noted that the consultants undertaking the 'Baseline Aquatic Biology and Water Quality Study' identified 3 species of frog during survey work.

A detailed faunal survey to the level expected for a level 2 survey to satisfy EPA's expectations in Guidance 56 should be undertaken so the proposal can be appropriately assessed.

The report states 'A very low 16 species of reptile are predicted to occur in the habitats of the Survey Area'. what is the basis for this statement, it should be referenced.

Memorandum

TO: PETER WALKINGTON

FROM: TERRESTRIAL ECOSYSTEMS BRANCH

CC:

DATE: 06 FEBRUARY 2008

RE: BUREKUP MINERAL SAND MINE

FILE NO:

In examining the EPS and the supporting documentation the following concerns have arisen.

VEGETATION AND FLORA, AND FAUNA

Vegetation within the survey area falls within the Guildford vegetation complex, of which only 4.4 % of the original extent remains on the Swan Coastal Plain within the Greater Bunbury Region, and only 0.4% is in existing and proposed Regional Open space. This is well below the 30% target for reservation of vegetation complexes occurring within the Greater Bunbury Region.

EPA Guidance 10 for Level of Assessment for Proposals Affecting Natural Areas within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region states that 'For those ecological communities where less than 10% remain, all areas are regionally significant, irrespective of the level of constraint on the land. Most communities in this category are communities typical of the eastern side of the Coastal Plain (principally the Pinjarra Plain). Therefore all of these remnants are regionally significant under the Rarity criterion and should be retained.

Some areas of vegetation, primarily on roadsides and drainage lines in the north eastern part of the study area appear to have been missed in the vegetation map of the site provided in the EPS and November 2007 flora report. These omissions conflict with the vegetation mapping supplied in Figure 1 of the original referral form within which these remnants are clearly marked. An explanation for this discrepancy was requested in previous correspondence but no such explanation has been received other than the mapping provided in the updated flora report (November 2007) and in the EPS of the remnants in question being situated in areas marked as completely degraded. Examination of GIS orthophotos of this site indicate that these remnants contain dense trees and native understorey which do not appear completely degraded. The EPS currently downplays the conservation value of the vegetation in the study area.

The road verges within the site contain some areas of good condition (and some very good), and many other areas contain dense tree canopy. These areas are of value as fauna habitat, and many bird species have been observed using these trees especially in such a highly fragmented landscape. The comment provided by the proponent that such corridors do not 'have any significant value as an ecological linkage' were made in the original fauna report (Ninox 2006). No other comments about locally or regionally significant linkages were found

in the new documentation supplied. The significance of the remnant vegetation within the study area from an ecological linkage perspective should be acknowledged in the EPS.

The initial flora and vegetation survey was undertaken in summer (December 2005), which is inappropriate for this region. EPA Guidance 51 states that 'if the botanical survey is undertaken in non-optimal times...supplementary surveys must be undertaken at optimal times.

Given that no detailed fauna survey has been undertaken, as confirmed in the proponents response to the EPA letter 2 May 2007, there is no justification for the statement that 'there are no fauna habitats of particular significance within the Burekup Survey Area' as the data is not available to back up this statement. Similarly information and data are required to justify the statement in the Ninox 2006 fauna report that'...It (road verge vegetation) does not have any significant value as an ecological linkage...'. Of the 69 bird species identified in the literature review as predicted to occur within the study area the Ninox field survey only found 14. This indicates that the fauna survey conducted was not of a scale to provide conclusive information.

The fauna survey (February 2006) was not conducted at an optimal time of year. The fauna report has not incorporated the 3 species of frog or the 8 species of bird identified in the Baseline Aquatic Biology Survey (November 2005) into the species list. This is despite stating that a literature search of published and unpublished information for the location had been undertaken. This also indicates that the fauna survey conducted was not adequate.

The statement in the EPS 'While Carnaby's Cockatoo may feed in the area it is considered unlikely, given the condition of the vegetation, that there would be any breeding in the Wandoo trees that remain in paddocks and roadsides.' This statement still needs to be qualified as stated in our previous advice.

Both the EPS and the Ninox 2006 fauna report comment on Carnaby's Cockatoo *Calyptorhynchus latirostris* and Baudin's Cockatoo *Calyptorhynchus baudinii* as having not recently fed on the Marri in the study area. The report needs to acknowledge the probability that both of these species will periodically feed on the Marri found in these remnants. Further, in table 17 of the EPS it is stated that it is unlikely that the proposed disturbance would impact significantly on either of these species. Both Carnaby's Cockatoo, and Baudin's Cockatoo have protected status under the *Environmental Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*) and the *Wildlife Conservation Act 1950* (*WC Act 1950*). Given the decline in habitat and resources for these species, particularly on the Swan Coastal Plain, any reduction in resources may have a significant impact on these species. Contrary to comments in the EPS Baudin's is found on the southern part of the Southern Swan Coastal Plain. It is also likely that the Red-tailed Black Cockatoo (a Schedule 1 species) may be present.

The fauna survey should include a thorough assessment (including looking for chewed seed capsules) of the trees in the study area and road verges to determine the whether they are being used by any of the 3 species of cockatoo, referred to above.

While it is noted that Table 7 of the EPS now lists a potential of 18 reptile species present. Our previous advice 15 June 2007 (see below) still needs to be addressed.

'A very low 16 reptiles are predicted to occur ...' is dismissive as the sixteen species might be a significant proportion of the number actually expected in the region. The report needs to state the expected reptile assemblage then the number of species identified following survey work and then determine what proportion of the expected assemblage has been found.

Flora of Henty Brook Road Bushland

BUREKUP

Bushland Plant Survey
Wildflower Society of Western Australia

1996

Prepared by C. Tauss

Burekup Mineral Sands Project

Environmental Protection Statement

Draft for Government Review

November 2007

ILUKA

EXECUTIVE SUMMARY

Iluka Resources Limited (Iluka) (the Proponent) proposes to establish a mineral sands mine approximately 11 kilometres east of Bunbury and 150 kilometres south of Perth, in the Shire of Dardanup. The Burekup Mineral Sands Project (the Project) is part of Iluka's ongoing Southwest operations, being a continuation of operations as mining and production of heavy mineral concentrate (HMC) at other sites ceases. The Project is currently scheduled to commence on ground works in 2008, dependent on internal planning processes and the timely receipt of environmental and other approvals.

Pre-production earthworks will commence approximately four to six months prior to operations and include topsoil stripping, overburden removal, installation of drainage and noise bunds, preparation of haul roads and construction of infrastructure.

The Project consists of several buried heavy mineral strands in the Yoganup formation overlain by six to 10 metres of unmineralised clayey sands of the Guildford formation. The overall resource is some 5 kilometres long, and up to 1500 metres wide, although the strands themselves rarely exceed 400 metres in width. The current mineable reserve is approximately 3.3 million tonnes with an average grade of 14.7% heavy mineral.

The ore will be mined progressively from several pits using dry mining techniques. Dewatering of groundwater inflows into the pit will be required to enable dry mining to occur. Ore will be screened and processed through an on-site concentrator with an anticipated throughput rate of 260 tonnes per hour to produce over 450,000 tonnes of HMC over the life of the Project. The Project will be mined over 1.5 years. HMC will be transported to Capel for further processing.

Process water supply demands will be preferentially met by surface water run-off and mine dewatering. It is proposed that additional water will be sourced from the Harvey Water irrigation system. A water storage dam is proposed to be developed adjacent to the concentrator.

The Project disturbance area is largely cleared agricultural land. While the majority of the proposed disturbance area is owned by Iluka, there are five other private landowners with property partially or wholly within the proposed disturbance area. Individual agreements will be reached with each landowner to allow access. The disturbance area also includes road reserves vested in the Shire of Dardanup. There are also a number of residences located in the vicinity of the disturbance area. The majority are to the Southwest of the disturbance area.

Workshops, fuel storage, process water dam, offices and other infrastructure will be located in close proximity to the concentrator.

The Project will be staffed with approximately 25 on-site Iluka personnel including administration, mine planning, surveying and metallurgical staff and approximately 55 earthmoving contractors, plus contractors to carry out specialised tasks as required. Other environmental, mine geology and laboratory requirements will be provided by staff based at existing Iluka operations.

The key characteristics of the Project are outlined in the following table.

Element	Description
Project Life (Mine Production)	1.5 years (continual operation)
Land Tenure	Privately owned land and road reserves
Area of Disturbance	375 hectares
Native vegetation disturbance	Up to 3.6 ha condition 3-4 Up to 59 ha condition 5
Mineable reserve	3.3 Million tonnes
Overburden Volume	3.2 Million tonnes
Rate of Extraction (overburden and ore)	1.6 - 2.4 Million tonnes per year
Processing Rate	260 tonnes per hour
Heavy Mineral Concentrate Production	450,000 tonnes over life of Project
Extraction Method	Dry mining
Depth of Mine Pit	Ranging from 5 m to 13 m
Water Supply Sources	600 - 1300 ML/annum superficial formations (pit dewatering) 1,100 ML/annum Harvey Water Irrigation System On-site rainfall capture
Heavy Mineral Concentrate transport to Capel	24 completed trips (48 movements) per day

The proposal will require approval from a number of State Government authorities, including the Department of Environment and Conservation (DEC), Department of Water (DoW) and the Department of Industry and Resources (DoIR).

The proponent is committed to undertaking a community consultation program from the early stages of the proposal development until rehabilitation is complete.

The proponent is committed to avoiding impacts where possible, and where this is not possible, to minimise their significance.

The impact assessment shows that the Project can be implemented without causing significant environmental impacts. The implementation of the Project will result in a net environmental benefit in the catchment. The local community will benefit through employment and increased spending in the region. The State will benefit from the ongoing royalties and taxes from the production of mineral sands.

The key environmental issues associated with the Project are considered to be:

- Management of groundwater drawdown beneath groundwater dependent ecosystems (GDEs);
- Management of groundwater drawdown within potential acid sulphate soils (PASS) areas below the orebody;
- The potential impacts of noise on nearby residents; and
- Clearing of native vegetation within the area of disturbance.

Assessments of these impacts are detailed in sections 9, 10 and 11 of this document.

The following table shows the environmental factors that were identified during the preparation of the Environmental Protection Statement (EPS) and addressed in this document.

Summary of Environmental Factors

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
BIOPHYSICAL					
Landform and Soils	To maintain the integrity, ecological functions and environmental values of the soil and landform.	The landscape is flat to gently undulating with small localised rises separated by broad, low-lying depressions. Depressions seasonally inundated. 4 SMUs have been defined which reflect poorly drained soils of the Guildford Formation on the Pinjarra Plain	Disturbance to landforms will occur from the excavation of mining pits.	Topsoils, subsoils and overburden will be removed and stockpiled separately for backfill of mining voids to assist in recreating a soil profile that allows return to the pre-mine land use. A Preliminary Rehabilitation Management Plan has been prepared.	Reinstatement of landforms and soil profiles compatible with an agricultural landuse.
Groundwater	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected. To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	The area is partially within the Dardanup Groundwater Management Sub-area of the Bunbury Groundwater Area, and partially within unproclaimed groundwater area. Deposit lies within the superficial formation. 22 landowner bores occur in the nearby area. Variations of greater than 1 pH unit and up to 4 140 μ^{-1}.	Dewatering of pits and abstraction will cause localised groundwater drawdown. Surrounding landowner bores and dams unlikely to be affected, only one bore expecting reduction in groundwater levels greater than 1 m (1.3 m).	Groundwater drawdown and recovery has been modelled. A Water Management Plan and Operating Strategy has been prepared.	Groundwater levels are expected to return to within 1 m of pre-disturbance levels 8 months after mining is complete. Supply of water from landowner bores will not be affected.
Acid Sulfate Soils	To maintain the integrity, ecological functions and environmental values of the soil and landform.	Acid Sulfate Soil (ASS) study has identified no ASS within the mine pit. Potential Acid Sulfate Soils (PASS) are present below the base of the mine pit.	Very low potential for exposure of potential acid sulphate soils (PASS) as these are located below the base of the pit. Dewatering may result in oxidation of PASS below the pit.	Mining methods may be altered where the base of the pit is close to the underlying PASS to reduce groundwater drawdown needs, maximising saturation of PASS.	No impact from acid sulphate soils.

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Surface Water	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected. To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Project located within two sub-catchment of the Leschenault Estuary – Lower Collie catchment. Numerous small drains and irrigation channels occur within and near the Project. One conservation category wetland over 100 m from the pit One resource enhancement wetland over 500 m from the pit Both wetlands have existing disturbance. Quality measurements taken indicate pH ranged from 6.1 to 7.49 across the sites, and average electrical conductivity ranged from 235 µS/cm to 932 µS/cm.	Disturbance has the potential to affect water quality of surface water and run-off.	Control measures such as bunding, sumps and stormwater management systems implemented to prevent loss of water from disturbance areas to the surrounds. Any water discharges from mining operations will be licensed and regularly monitored.	Water release will be in accordance with licence conditions.
Vegetation and Flora	To maintain the abundance, diversity, geographic distribution and productivity of vegetation communities and flora at the species and ecosystem levels through the avoidance or management of adverse impacts and through improvement in knowledge.	The site has been extensively cleared for agricultural purposes, contains isolated trees and several areas of native vegetation Nine vegetation community types recorded, little good or very good vegetation, mostly associated with road reserves. C4 vegetation on Simpson Rd Reserve has dominant species similarities to TEC SCP 3a, but low overall floristic similarities. No DRF or priority flora recorded during surveys in 2005 and 2007 4 Declared Plants (weeds) recorded.	Mining operations will occupy 374.5 ha of land, 312 ha being completely cleared, 59 ha of degraded vegetation and 3.6 ha of good or very good condition vegetation. Low to moderate risk of groundwater drawdown impacts on 4.5 ha of vegetation.	Clearing of native vegetation will be restricted to the disturbance footprint. If groundwater drawdown reduces vegetation density, infill planting of species will be conducted A Vegetation and Flora Management Plan has been prepared A Preliminary Rehabilitation Management Plan has been prepared	No impact to potential TEC If groundwater drawdown impacts are experienced they will be limited to crown decline and/or succession of some species. Area will be rehabilitated to a predominantly agricultural system with comparable vegetation values to those present prior to mining.
Fauna	To maintain the abundance, diversity, geographic distribution and productivity of native fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Degraded vegetation is of little habitat value to native fauna. Road reserve vegetation is too narrow and lacks linkages to be of significant benefit to native fauna. 20 avifauna, no native mammals, 3 frogs and 2 native fish recorded.	Potential loss of habitat. Potential impact very low due to lack of significant habitat	No specific management measures required. A Rehabilitation Management Plan has been prepared.	No significant impacts anticipated for fauna.
POLLUTION MANAGEMENT					

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Dust	To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Potential for dust generation in relation to existing mining and agricultural land use.	Potential dust generation by earthmoving activities and exposed stockpiles and rehabilitated areas.	Dust will be controlled through a number of management practices which may include: • Minimise clearing and open areas; • Not disturbing topsoil until required; • Regular watering and grading of roads; • Using biodegradable chemical suppressants; • Stabilising bunds and stockpiles from wind erosion; • Growing temporary crops to bind soil and lift wind from surface; and • Re-establishment of pasture as soon as possible after mining has been completed.	No adverse impacts on environmental values or human health, welfare or amenity.
Noise	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.	Environmental background noise levels are typically 25-29 dB(A) (L90 of LA90) during both day and night hours. Existing mineral sands mine in immediate area.	Noise modelling indicates worst case conditions may result in exceedances at 5 nearby residences to Noise Regulations.	Construction of earth noise bunds. Installation of noise enclosures. Mobile equipment fitted with directional broadband white noise alarms. Neighbour agreements to be in place prior to commencement of mining. A Noise Management Plan has been prepared.	Activities will be in accordance with Noise Regulations most of the time. Landowner and neighbour agreements will be in place to address noise amenity.
Radiation	To ensure that radiological impacts to the public and the environment are kept as low as reasonably achievable and comply with acceptable standards.	Pre-mine radiation survey will be conducted prior to disturbance.	Exposure to low level radioactive minerals.	Implement South-West Radiation Management Plan	Handling, storage and transport of ore and HMC able to be conducted safely. Post mining values will be similar to the pre-mining value.
Light	To avoid or manage potential impacts from light overspill and comply with acceptable standards.	Several residences and roads nearby are potential light receptors.	Night lighting may affect nearby residents and traffic	In-pit hopper, screen plant and concentrator to be located below natural surface level or behind constructed bunds to minimise nuisance light. The majority of earthmoving activities will be conducted between 6 am and 7 pm. Light towers will be erected so as to concentrate light on work areas.	No significant adverse impacts from site lighting.
Non-process Waste	Ensure that wastes are managed and disposed of in a manner that does not result in long-term impacts on groundwater, surface water and the natural environment.	NA	Mismanagement of waste creates large waste streams that are difficult or environmentally unacceptable to dispose or creates contamination.	Encourage use of landfill alternatives. Ensure non-process waste streams disposed of appropriately.	No long term impacts from non-process waste.

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Process Waste	Ensure that waste streams from the process are returned to the mining void in a manner that allows the re-creation of the original landscape and landuse.	NA	Inappropriate handling of process wastes may affect landform reestablishment.	Ensure process waste streams handles appropriately. A Rehabilitation Management Plan has been prepared.	Return of process wastes to pits will result in re-establishment of the pre-mining land use.
Greenhouse Gases	To minimise emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions.	Project is a continuation of operations in the Southwest of WA.	Emission of greenhouse gases directly and indirectly as a result of mining and mining-related activities.	Ensure efficient use of all machinery. Monitor and report greenhouse gas emissions in Annual Environmental Report.	Greenhouse gas emissions will not be significantly altered.
SOCIAL ENVIRONMENT					
Aboriginal Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	No archaeological or ethnographic sites were found within the disturbance area. An ethnographic site occurs outside of the disturbance area	Potential for discovery of aboriginal heritage sites within the disturbance area. The Ethnographic site outside of the disturbance area will not be impacted.	Provisions of the Aboriginal Heritage Act will be complied with. If any sites are discovered during operations will be reported to DoIR and DIA.	No impact to Aboriginal heritage and compliance with the Aboriginal Heritage Act 1972.
European Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	No European heritage sites identified at Burekup	No impact identified.	Any site discovered during operations will be reported to the DoIR and the Shire of Dardanup	No impact to European heritage
Transport	To ensure that traffic activities resulting from the Project can be managed to an adequate level of public safety and have minimal impact on surrounding neighbours and landowners and traffic congestion.	The key transportation corridors are Dowdell's Line Rd (currently used for existing mining operation), South-West Highway, Robertson Rd and Bussell Highway (MRWA heavy haulage routes). Transport will comprise of four pocket road trains, totalling 48 movements (24 completed trips a day), operating 24 hours a day.	Additional heavy traffic has the potential to impact noise, amenity and public safety. Construction traffic (wide loads) may cause short term disruptions to traffic. Several roads will require closure and/or diversion to construct and operate the Project	Liaison with the Shire of Dardanup and MRWA to minimise disruption to traffic. Ensure new diversions and intersections are appropriately designed. Use of designated heavy haulage routes.	Some short term disruption to traffic during construction, and during closure and diversion of roads Minimal disruption to traffic from transport of heavy mineral to Capel.
Visual Amenity	The objective is to ensure that the visual amenity of the area adjacent to the Project is not unduly affected by the proposal.	Agricultural and adjacent mining land use, thus there is a minimal number of residences in close vicinity to the Project area.	Several of the nearby residences will have views of the Project. The township of Burekup will not have views of the Project.	Minimise clearing. Topsoil bunds to be vegetated. Conduct rehabilitation to agreed final landuse.	Visual impact will be reduced to as low as reasonably practical.

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TABLE OF SUPPORTING DOCUMENTS

PROVIDED ON ATTACHED CD

Pre-mine soil assessment for the proposed Burekup minesite (SWC, 2007a)

Burekup Deposit modeling of groundwater level impacts (PB, 2007)

Acid sulfate soil survey for the proposed Burekup minesite (SWC, 2007b)

Third-party review of acid sulfate soil assessment and management in selected mining operations in south-west Western Australia (Sullivan, 2007)

Reinterpretation of the PASS model for Burekup minesite (SWC, 2007c)

Baseline aquatic biology and water quality study (WRM, 2007)

Flora and vegetation assessment of the Burekup area (Mattiske Consulting Ptd Ltd, 2007)

Groundwater dependent ecosystem assessment for the proposed Burekup minesite (SWC, 2007d)

A vertebrate fauna assessment of the Burekup Mineral Sands Project area (Ninox Wildlife Consulting, 2006)

Environmental noise assessment of the proposed Burekup Mineral Sands Mine (SVT Engineering Consultants, 2007)

The report of an Aboriginal archaeological survey of the proposed Burekup Mineral Sands Mine (M70/0665, M70/0720), South West region, Western Australia (Anthropos Australis, 2007)

Report of an ethnographic survey of the proposed Iluka Resources Limited Burekup Mineral Sands Mine (M70/0652, M70/0720), near Bunbury, Western Australia (Ethnosciences, 2007)

Transport Study for the Burekup Mineral Sands Project Area (Wyntak Pty Ltd, 2007)

1. PURPOSE AND STRUCTURE OF THE DOCUMENT

The Burekup Mineral Sands Project (the Project) was referred to the Environmental Protection Authority (EPA) on 15 February 2007. The EPA determined that the likely environmental impacts are sufficient to warrant assessment at the level of Environmental Protection Statement (EPS). The EPA advertised the level of assessment in *The West Australian* on 8 October 2007.

This EPS aims to identify and assess the environmental effects of the proposal and to describe the management strategies the proponent will adopt to manage and minimise any adverse environmental effects.

The document provides the following information:

- A description of the project;
- The legislative considerations used to assess the project;
- A description of the existing environment;
- Details of Iluka's community and stakeholder consultation programme;
- An overview of Iluka's approach to environmental management;
- Identification of environmental factors;
- Expected impacts and management from development of the project;
- Details on preliminary rehabilitation management plan; and
- Discussion of offsets associated with this proposal.

A range of technical studies have been completed in preparing this document. Management plans have been prepared for key environmental factors associated with the project and are appended to the EPS. The technical studies are provided as supporting documents on a compact disc at the back of the EPS.

2. THE PROPONENT

Iluka is a major participant in the global mineral sands sector and involved in the sales and marketing of titanium based products (rutile, ilmenite, leucoxene and synthetic rutile) and zircon. Titanium minerals and zircon produced in Western Australia are used in every-day products such as paints, ceramics, cosmetics and food products. Currently, Iluka's mining and mineral processing operations in Western Australia are located in the Southwest, Peel & Mid West regions. Iluka has successfully mined and rehabilitated many mineral sands deposits since the 1950's. Iluka employs a total of approximately 1 400 employees and contractors across its Australian operations. For the year ended 31 December 2006, Iluka had sales of $1,003 million dollars across its operations.

Iluka has received several awards for environmental, community and operational performance, including a Golden Gecko for environmental performance in the Southwest WA in 1999, a gold award for community engagement excellence for the Douglas Project in the Murray Basin in 2005 and the Australian Maintenance excellence award 2004. The proponent can be contacted at:

Iluka Resources Limited
Level 23, 140 St Georges Terrace
PERTH WA 6000
ABN 34008675018

For further information contact:

Shannon Jones, Environmental Advisor
Tel: (08) 9360 4700
Fax: (08) 9360 4777
Email: shannon.jones@iluka.com

Table 1: Key Characteristics

Element	Description
Project Life (Mine Production)	1.5 years (continual operation)
Land Tenure	Privately owned land and road reserves
Area of Disturbance	375 hectares
Native vegetation disturbance	Up to 3.6 ha condition 3-4 Up to 59 ha condition 5
Mineable reserve	3.3 Million tonnes
Overburden Volume	3.2 Million tonnes
Rate of Extraction (overburden and ore)	1.6 - 2.4 Million tonnes per year
Processing Rate	260 tonnes per hour
Heavy Mineral Concentrate Production	450,000 tonnes over life of Project
Extraction Method	Dry mining
Depth of Mine Pit	Ranging from 5 m to 13 m
Water Supply Sources	600 - 1300 ML/annum superficial formations

	(pit dewatering) 1,100 ML/annum Harvey Water Irrigation System On-site rainfall capture
Heavy Mineral Concentrate transport to Capel	24 completed trips (48 movements) per day

3. PROJECT DESCRIPTION

Iluka proposes to establish a mineral sands mine at Burekup, approximately 150 kilometres south of Perth and 11 kilometres east of Bunbury, in the Shire of Dardanup (Figure 1). The Burekup Mineral Sands Project (the Project) is part of Iluka's ongoing Southwest Operations, being a continuation of operations as mining and production of heavy mineral concentrate (HMC) at other sites ceases. The Project is currently scheduled to commence on ground works in 2008, dependent on internal planning processes and the timely receipt of environmental and other approvals.

Situated on the Swan Coastal Plain, which is bounded by the coast and the Whicher Scarp, the Project is comprised of two mining tenements, M70/652 and M70/720, located between Henty Brook Road and Waterloo-Dardanup Road (Figure 2).

The Project disturbance area is largely cleared agricultural land. The area is covered by two mining leases, M70/652 and M70/720 (Figure 2). The details of those tenements are provided in Table 2.

Table 2: Mining Leases Covering the Burekup Project Area

Mining Lease	Date Granted	Date of Expiry	Holder
M70/652	19/08/1990	16/07/2014	Iluka Resources Limited
M70/720	12/09/1991	25/03/2014	Iluka Resources Limited

The majority of the proposed disturbance area is owned by Iluka. There are four other private landowners with property partially within the proposed disturbance area (Figure 3). Individual agreements will be reached with each landowner to allow access. The disturbance area also includes road reserves vested in the Shire of Dardanup. There is no vacant crown land within the disturbance area. There are no conservation reserves within 2 kilometres of the disturbance area, however there is a nature reserve related to the South West Highway and the railway line, located over 2 kilometres north west of the disturbance area (Figure 3).

The site will be established and operated in a similar fashion to other Iluka operations in the Southwest.

The Project consists of several buried heavy mineral strands in the Yoganup formation overlain by six to 10 metres of unmineralised clayey sands of the Guildford formation. The overall resource is some 5 kilometres long, and up to 1500 metres wide, although the strands themselves rarely exceed 400 metres in width. The current mineable reserve is approximately 3.3 million tonnes with an average grade of 14.6% heavy mineral.

Process water supply demands will preferentially be met by surface water run-off and mine dewatering. It is proposed that additional water will be sourced from the Harvey Water irrigation system.

The Project involves dry mining of heavy mineral resources and the production of heavy mineral concentrate (HMC).

The Project consists of several mine pits extending over almost 5 kilometres (Figure 4). The maximum pit depth is expected to be approximately 13 m. It is proposed to commence

mining in the south of the deposit. Ore from the northern mine pits will be trucked to the in-pit hopper located in the southern mine pit.

Mining is expected to take approximately 1.5 years. Decommissioning and rehabilitation will take approximately two years to complete, plus three years of rehabilitation maintenance. Topsoil will be stripped from each pit and stockpiled for use in rehabilitation. Internal roads and pipeline corridors will be constructed from each pit to the concentrator as required.

Closure of several Shire roads will be required. These include:

- Dowdells Line Road from O'Conner Road to St Helena Road;
- Edwards Road for 850 metres east of Dowdells Line Road;
- St Helena Road for 950 metres west of Dowdells Line Road; and
- A portion of Harris Road at the southern end of the site may be required to be closed.

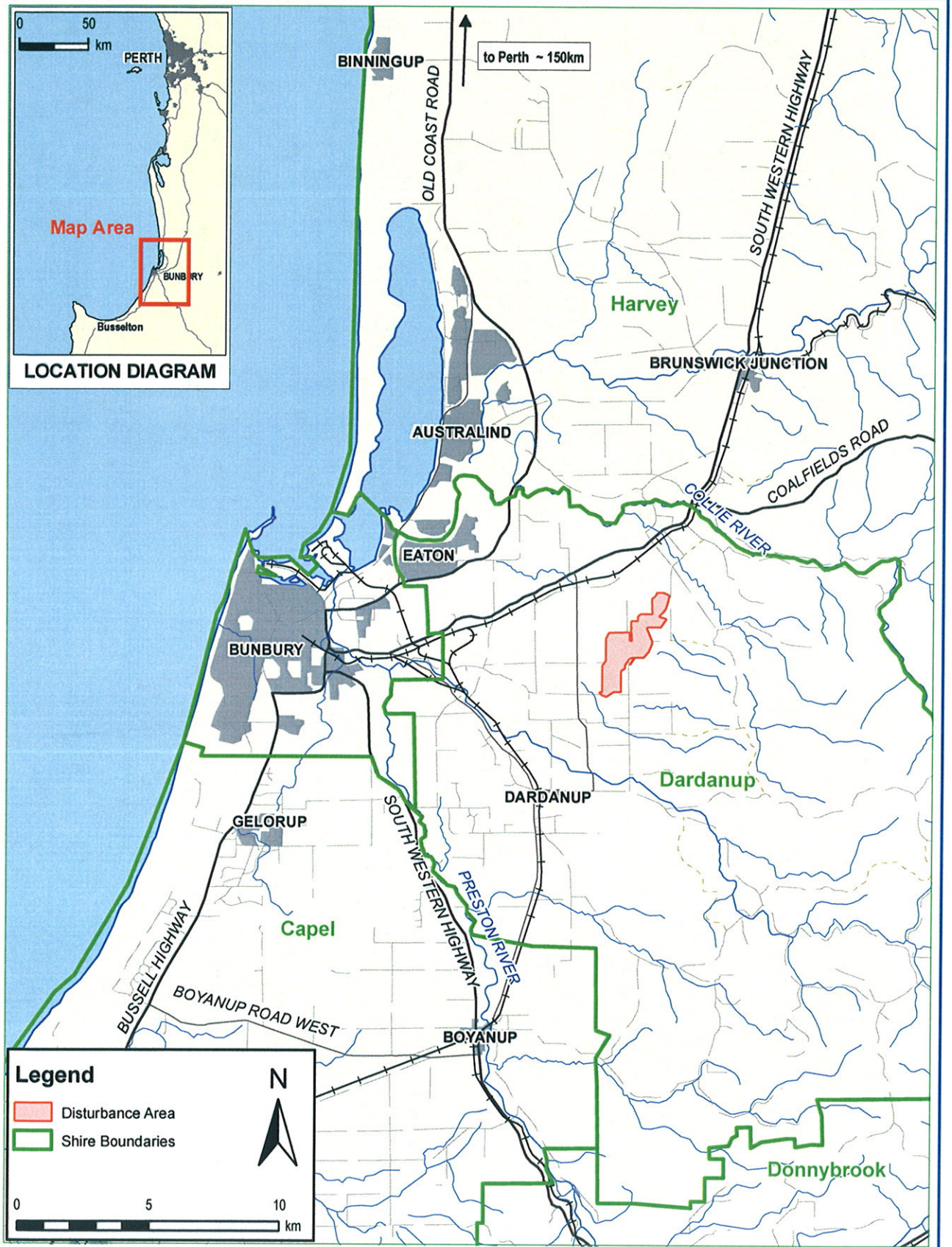
Due to these road closures, several road diversions will be required. These include:

- A road diversion will be installed from O'Conner Road in the north, past Edwards Road, to Dowdells Line Road in the South, re-connecting traffic on O'Conner and Edwards roads to Dowdells Line Road at the southern end; and
- A small diversion of Harris Road may be implemented at the southern end of the site, to allow the continued use of this Road.

Each pit will be backfilled with sand tails, clay fines and overburden at the completion of mining. Some overburden will be used for noise bunding.

The concentrator will be located adjacent to the main mine pit, with site access from Dowdells Line Road. Workshops, fuel storage, process water dam, offices and other infrastructure will be located in close proximity to the concentrator.

It is currently proposed that a concentrator from an existing Iluka operation will be relocated for the Project. This is scheduled to occur in early 2009 in line with the Iluka mine planning process. This schedule is updated on an annual basis and changes may occur based on the remaining reserves at current operations, market fluctuations and processing plant blending requirements.



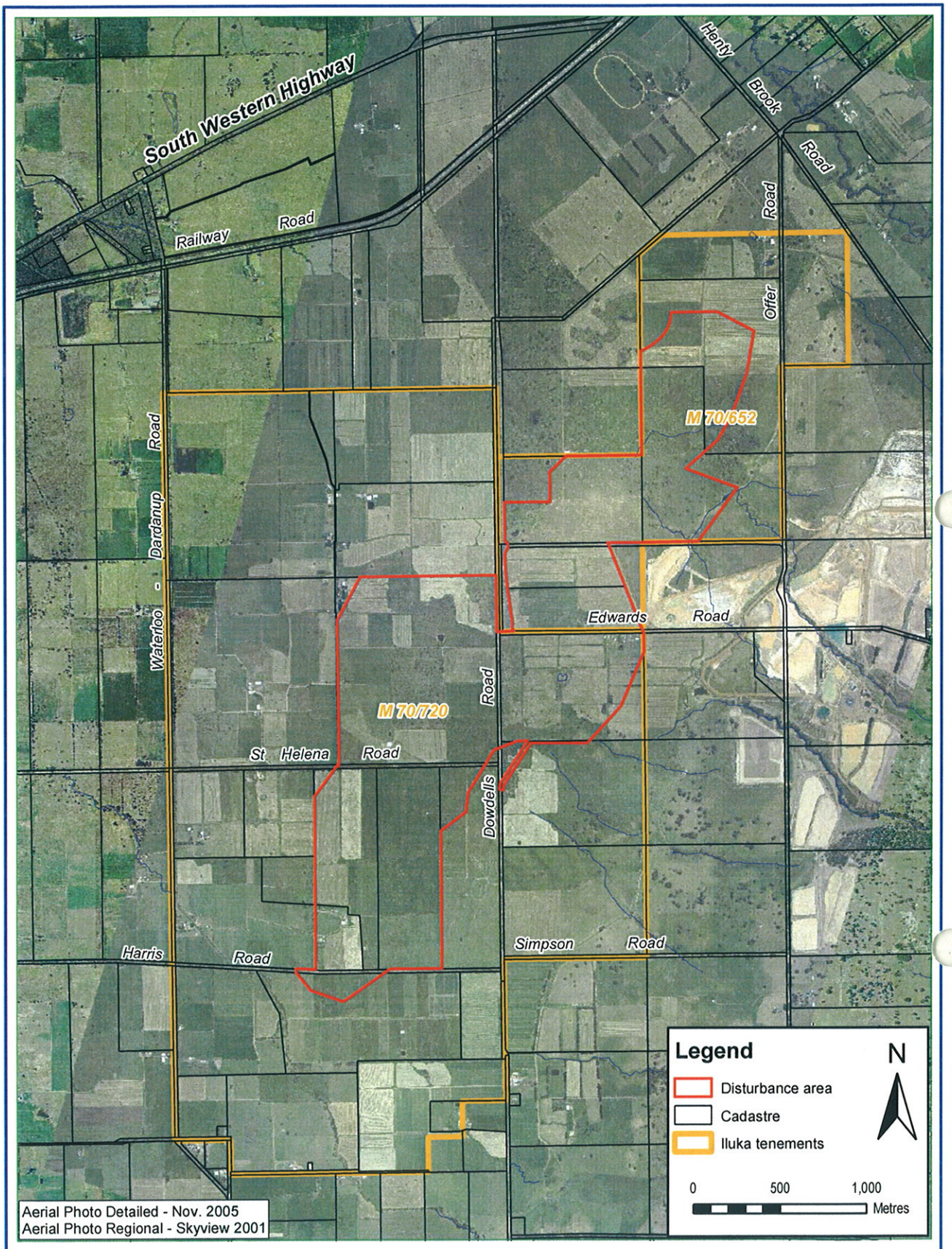
BUREKUP

REGIONAL LOCATION PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:200,000 (A4) DATE: 23 Nov. 2007 DWG No: 170435 ver.02

FIGURE: 1



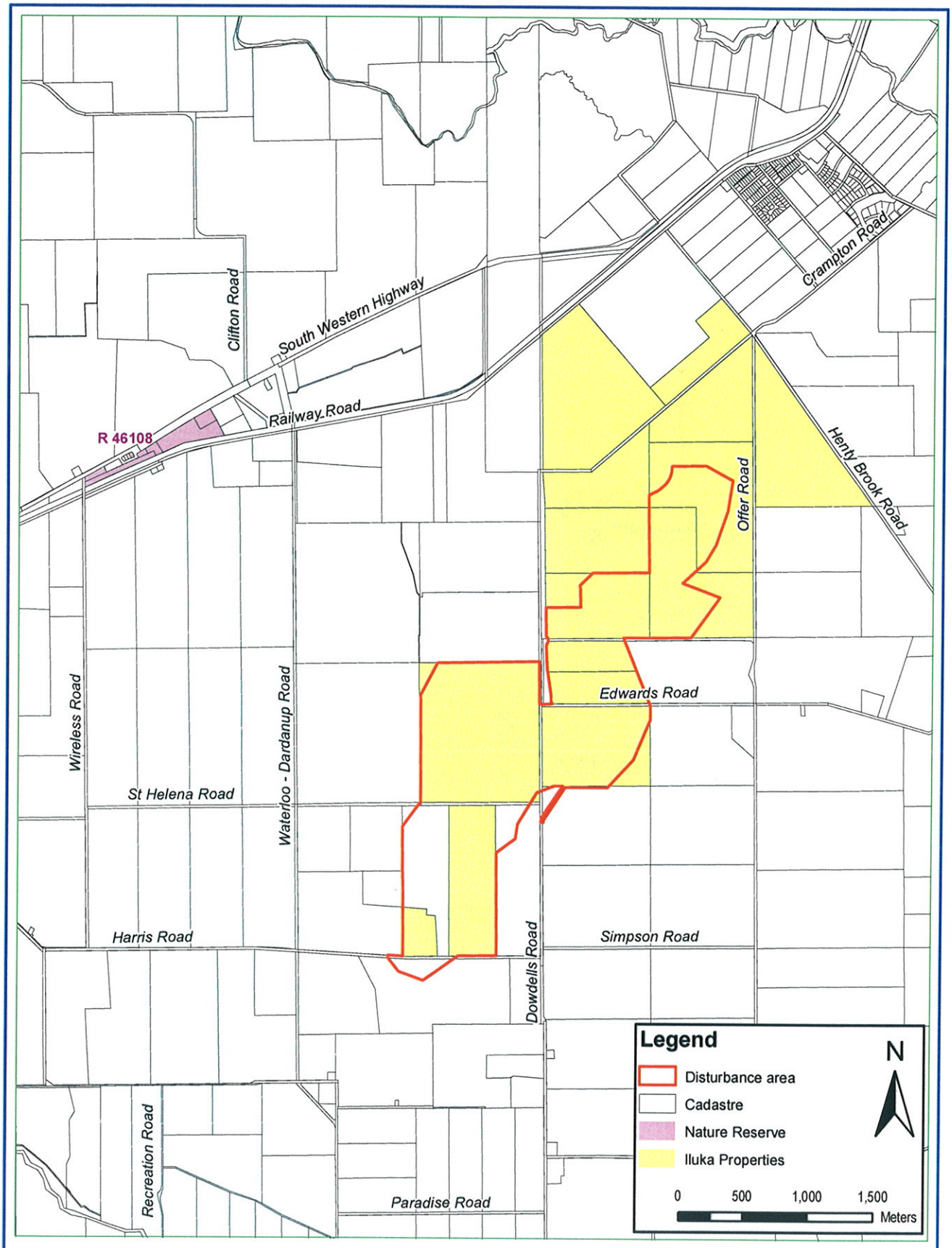
BUREKUP

SITE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 170439 ver.03

FIGURE: 2



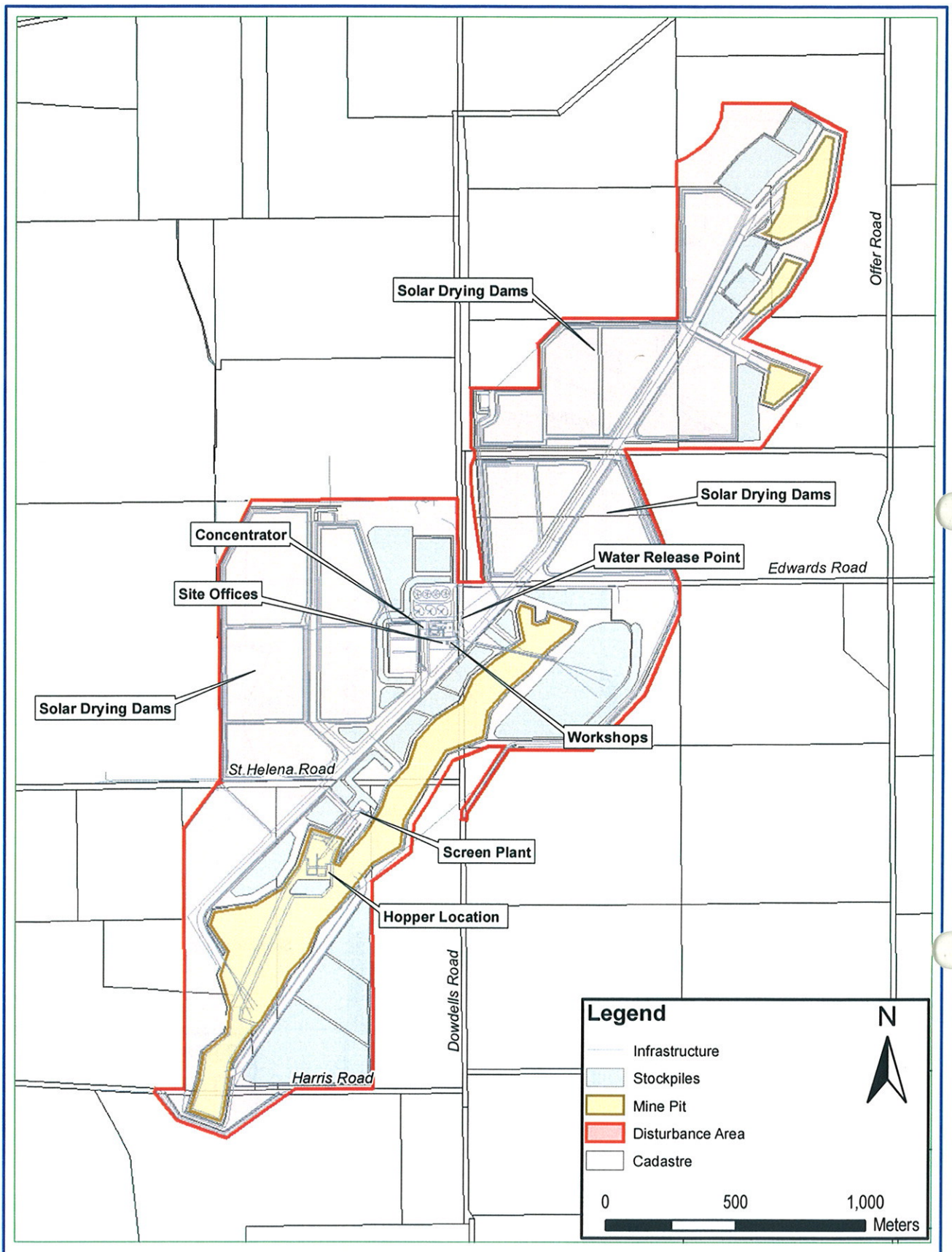
BUREKUP

LAND TENURE

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:40,000 (A4) DATE: 23 Nov. 2007 DWG No: 176621 ver.03

FIGURE: 3



BUREKUP

MINE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 14 Nov. 2007 DWG No: 178372 ver.00

FIGURE: 4

3.1. Construction

The construction period will take approximately four to six months. Activities conducted during this period will include:

- Development of site access road and plant site. This will include site levelling, drainage controls, bituminising, power supply and construction of water storage dams, fuel farm, workshops and offices.
- Relocation of a concentrator and other plant from existing operations to Burekup. The concentrator will be dismantled and moved by road. All equipment will be transported in accordance with local shires, MRWA and police requirements.
- Reconstruction of the concentrator and other plant at Burekup. This will include the construction of any additional infrastructure required specifically for the handling of Burekup material.
- Haulroad development and topsoil and overburden stripping from the southern mine pit.
- Mining and stockpiling of heavy mineral from the first pit and installation of the in-pit hopper.
- Construction of Solar Drying Dams.
- Creation of bunds to mitigate noise, visual and drainage impacts.

3.2. Mining Operations

The proposed overburden mining method is likely to incorporate scrapers, excavators and trucks. Overburden will be returned directly to the pit where possible or stockpiled on surface for later return. A portion of overburden will be used for bunding, pads and roads.

The ore will be mined using dry mining techniques. The proposed ore mining method involves excavating the ore and hauling it to the in-pit hopper, where the first stage of screening occurs. The ore may also be stockpiled near the hopper during the day and fed into the hopper by front-end loader at night. The screened ore is then conveyed to a wet screening plant, consisting of a double deck screen, scrubber and trommel. Oversize material greater than 2.4 millimetres will be removed through the screen plant. From the screen plant, the ore is transported via pumps and pipelines to the wet concentrator.

Mine pits will be dewatered via sumps in the pit floor in order to allow mining where the ore extends below the water table.

The in-pit hopper is most likely to remain in the one location for the life of the mine. The concentrator and screen plant infrastructure will remain in one position over the life of the mine.

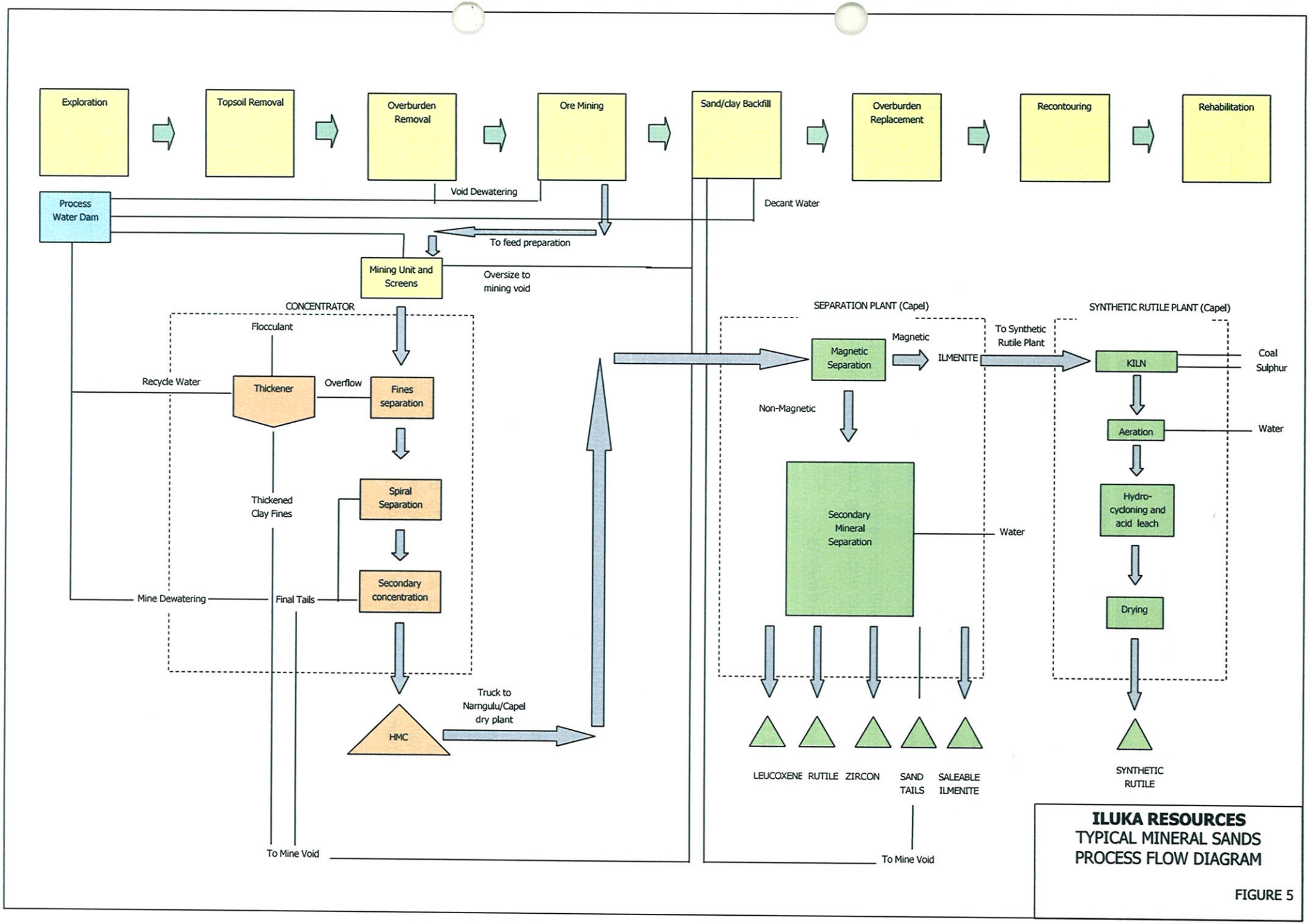
Ore will be processed through an on-site concentrator with an anticipated throughput rate of 260 tonnes rougher head feed per hour to produce 450,000 tonnes of HMC over the life of the Project. The concentrator utilises conventional wet gravity separation techniques using a multi-stage spiral circuit. The plant will produce HMC, sand tailings and clay fines. The HMC will be stockpiled prior to road haulage to the North Capel separation plant for further processing.

Process water supply demands will be preferentially met by surface water run-off and mine dewatering. It is proposed that additional water will be sourced from the Harvey Water Irrigation system. A water storage dam is proposed adjacent to the concentrator.

The sand tailings produced from the concentrating process consist of reject sand and water and are returned to the mine void. The clay fines overflow (nominally the -53μm fraction), separated during the concentration process, will be pumped to a thickener. A flocculent will be added to the thickener using dedicated automatic dosing equipment. The flocculent aids densification prior to pumping clay fines.

Clay fines will be placed in solar drying dams to allow settlement and drying prior to being replaced in-pit with sand tails and overburden removed during the mining process. Following backfill the area will be rehabilitated to a landform and landuse similar to the surroundings.

The process flow chart is shown in Figure 5.



ILUKA RESOURCES
TYPICAL MINERAL SANDS
PROCESS FLOW DIAGRAM

FIGURE 5

3.3. Dangerous Goods and Hazardous Substances

The screening and concentration process proposed for the Project does not involve the use of any toxic chemicals with the exception of flocculant which is discharged at levels below detection limits. Therefore, the use of potentially dangerous or hazardous substances will be limited. Material Safety Data Sheets for all products will be kept on site by Iluka.

3.4. Workforce

The Project will be staffed with approximately 25 on-site Iluka personnel including administration, mine planning, surveying and metallurgical staff and approximately 55 earthmoving contractors. Other environmental, mine geology and laboratory requirements will be provided by staff based at existing Iluka operations.

A number of contractors will also be employed from time to time to carry out specialised tasks including maintenance, engineering construction, fencing and rehabilitation.

3.5. Resource Requirements

3.5.1. Power

Power consumption is anticipated to be 18 GWh of electricity annually. Iluka has reviewed the Project's power requirements and the preferred source of power is from the Western Power grid.

3.5.2. Fuel

Diesel fuel for vehicles, generators and pumps will be trucked to site and stored in appropriately bunded hydrocarbon facilities.

3.5.3. Water

Mine pits will be dewatered to allow dry mining to occur. The annual process water demand for the Project is expected to be approximately 13,000 ML/annum. Pit dewatering and incident runoff will be preferentially utilised as the project water supply. A water dam is proposed to be developed adjacent to the concentrator and water recaptured from the process will be directed to the dam to be reused. Supplementary water supplies will be sourced from the Harvey Water Irrigation system.

Groundwater inflows into the mining void are predicted to range between 8.2 L/s and 56.8 L/s over the life of the mine. A total of 1 600 ML of water is predicted over the life of the mine.

3.6. Project Benefits

Iluka plans to continue its mining and processing operations in Western Australia. The Project is part of Iluka's ongoing Southwest Operations. Continuation of mining and processing operations provides economic benefits including:

- Direct and indirect local and regional employment and training opportunities;
- Export earnings;

- Revenue to State and Federal Governments through taxes on earnings, royalties and through purchases; and
- Regional and national economic growth.

Mineral sands mining is a temporary land use which has the ability to provide maximum utilisation of natural resources.

Iluka will investigate post-mining land use options to maximise the social, economic and environmental benefits of the mined area. This includes improvements in remnant vegetation management, improved agricultural potential through implementation of sustainable farming practices and potential opportunities for alternative land development.

The sustainable development approach to the Project allows for significant economic, environmental and social benefits to be achieved for the State, Iluka and the community.

3.7. Evaluation of Alternatives and preferred options

It is currently proposed that a concentrator from an existing Iluka operation will be relocated to Burekup in 2009, in line with the Iluka mine planning process. This schedule is updated on an annual basis and changes may occur based on the remaining reserves at current operations, market fluctuations and processing plant blending requirements.

Feasibility studies have identified the ore bodies and associated site layout and infrastructure requirements. Options that have been considered for this proposal include:

- Alternative locations of facilities such as stockpiles, roads and solar drying dams;
- Alternative transportation routes; and
- Strategies for clay and sand disposal, with consideration of new disposal techniques.

4. LEGISLATIVE CONSIDERATIONS FOR THE PROJECT

The Project will adhere to requirements of all applicable legislation and regulations associated with that legislation.

Current Federal legislation and regulations applicable to the Project are:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Intergovernmental Agreement on the Environment 1992*
- *National Strategy for Conservation of Australia's Biological Diversity 1996*
- *National Strategy for Ecologically Sustainable Development 1992*
- *Native Title Act 1993*

Current Western Australian State legislation and regulations relevant to the Project are:

- *Agriculture and Related Resources Protection Act 1976*
- *Aboriginal Heritage Act 1972*
- *Bush Fires Act 1954*
- *Conservation and Land Management Act 1984*
- *Dangerous Goods Regulations 1992*
- *Environmental Protection Act 1986 (as amended)*
- *Environmental Protection (Clearing of Native Vegetation) Regulation 2004*
- *Environmental Protection (Noise) Regulations 1997*
- *Explosives and Dangerous Goods Act 1961*
- *Health Act 1911*
- *Heritage of Western Australia Act 1990*
- *Land Act 1933*
- *Land Administration Act 1997*
- *Local Government Act 1995*
- *Mines, Safety and Inspection Act, 1994*
- *Mines, Safety and Inspection Regulations, 1995*
- *Mining Act 1978*
- *Mining Regulations 1981*
- *Occupational Health, Safety and Welfare Act 1984 (as amended)*
- *Occupational Health, Safety and Welfare Regulations 1988*
- *Rights in Water and Irrigation Act 1914*
- *Soil and Land Conservation Act, 1945*
- *Town Planning and Development Act 1928*

- *Water Authority Act, 1984*
- *Waterways Conservation Act 1976*
- *Wildlife Conservation Act 1950*

A number of policies, EPA Position Statements, EPA Guidance Statements and relevant environmental guidelines and Codes of Practice are applicable to the Project, including:

- 1996 National Strategy for the Conservation of Australia's Biological Diversity
- 1992 National Strategy for Ecologically Sustainable Development
- National Environment Protection Measure (NEPM) for Air Quality
- Intergovernmental Agreement on the Environment 1992
- National Strategy for Ecologically Sustainable Development 1992
- EPA Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation, with Particular Reference to the Agricultural Area (EPA, 2000a)
- EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002a)
- EPA Position Statement No. 4: Environmental Protection of Wetlands (EPA, 2004a)
- EPA Position Statement No. 6: Towards Sustainability (EPA, 2004b)
- EPA Position Statement No. 7: Principles of Environmental Protection (EPA, 2004c)
- EPA Position Statement No 8: Environmental Protection In Natural Resource Management (EPA, 2005a)
- EPA Position Statement No. 9: Environmental Offsets (EPA, 2006a)
- EPA Guidance No. 6: Rehabilitation of Terrestrial Ecosystems (EPA, 2006b)
- Draft EPA Guidance No. 8: Environmental Noise (EPA, 2007a)
- EPA Guidance No. 10: Level of Assessment for Proposals Affecting Natural Areas Within the System 6 Region or the Swan Coastal Plain Portion of the System 1 Region (EPA, 2006c)
- EPA Guidance No. 12: Minimising Greenhouse Gas Emissions (EPA, 2002b)
- Draft EPA Guidance No. 19: Environmental Offsets (EPA, 2007b)
- Draft EPA Guidance No. 33: Environmental Guidance for Planning and Development (EPA, 2005b)
- EPA Guidance No. 41: Assessment of Aboriginal Heritage (EPA, 2004d)
- EPA Guidance No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004e)
- EPA Guidance No. 55: Implementing Best Practice in Proposals Submitted to the Environmental Impact Assessment Process (EPA, 2003)
- EPA Guidance No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004f)

Guidelines developed by other agencies that are applicable to the proposal, include:

- Mining Environmental Management Guidelines on the Safe Design and Operating Standards for Tailings Storage (DoIR, 1999)
- Mining Environmental Management Guidelines: Development of an Operating Manual for Tailings Storage (DoIR, 2007)
- Water Quality Protection Guidelines (Nos. 1-11), Mining and Mineral Processing (WRC, 1999)
- Mine Closure Guideline for Minerals Operations in Western Australia (The Chamber of Minerals and Energy of Western Australia Inc, 2000)
- Strategic Framework for Mine Closure (Australian and New Zealand Minerals and Energy Council [ANZMEC] and Minerals Council Australia [MCA], 2000)

4.1. Environmental Protection Act 1986 (as amended)

The Proposal is being assessed under Part IV of the *Environmental Protection Act 1986* (WA) (as amended). If the Minister for the Environment decides that the proposal may proceed after considering the EPA assessment report on the proposal, the Minister will issue a statement that allows the proposal to be implemented and may contain conditions that will apply to the Project when implemented.

4.2. Rights in Water and Irrigation Act 1914

Iluka is required to obtain groundwater licences under the *Rights in Water and Irrigation Act 1914 (RIWI Act).* This will include an amendment to Iluka's existing licence for the Yarragadee aquifer (GWL 161847 (2)) and a new licence for dewatering of the superficial aquifer.

4.3. Responsible Authorities

The main agencies with an interest in the environmental assessment and management of the Burekup Project are:

- The Environmental Protection Authority (EPA);
- The Department of Environment and Conservation (DEC);
- The Department of Industry and Resources (DoIR);
- The Department of Water (DoW)
- The Department of Indigenous Affairs (DIA);
- The Department of Agriculture and Food (DAF);
- Main Roads of Western Australia (MRWA); and
- The Shire of Dardanup.

5. EXISTING ENVIRONMENT

5.1. Regional Setting

The Project is located to the south of the South West Highway, approximately 11 kilometres east of Bunbury and 150 kilometres south of Perth, in the Shire of Dardanup (Figure 1). Situated on the Swan Coastal Plain, which is bounded by the coast and the Whicher Scarp, the Project is comprised of two mining tenements, M70/652 and M70/720, located between Henty Brook Road and Waterloo-Dardanup Road (Figure 2).

The Project disturbance area is largely cleared agricultural land. Several agricultural water supply drains traverse the proposed disturbance area. While the majority of the proposed disturbance area is owned by Iluka, there are five other private landowners with property partially or wholly within the proposed disturbance area. Individual agreements will be reached with each landowner to allow access. The disturbance area also includes road reserves vested in the Shire of Dardanup.

5.2. Climate

The Project area experiences a Mediterranean climate characterised by warm, dry summers and cool, wet winters. The Bureau of Meteorology recorded rainfall at the Bunbury Post Office (station 9514), approximately 20 kilometres west of the Burekup site, from 1877 to 1985. The long term average rainfall recorded at the site was 870.7 mm/year. Bunbury Weather Station (Bureau of Meteorology station 9965) commenced in 1995. Rainfall and temperature data recorded at this station are shown in Table 3.

Table 3: Temperature and rainfall at the Bunbury weather station

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean max. temp. (°C)	29.1	29.6	27.6	24.0	21.1	18.4	17.2	17.3	18.2	20.5	24.2	27.1	22.9
Mean min. temp. (°C)	15.0	15.5	14.0	11.6	9.5	8.2	7.0	7.6	8.5	9.0	12.1	13.4	10.9
Mean rainfall	12.0	6.3	17.8	30.9	94.4	149.2	147.4	130.1	79.2	35.1	21.8	16.5	735.5

(Source: Commonwealth Bureau of Meteorology)

5.3. Geology

The Project is located within the Pinjarra Plain land system on the Swan Coastal Plain, at the footslopes of the Whicher Scarp and to the west of the Darling Scarp, within the Southern Perth Basin (Soil Water Consultants (SWC), 2007a). The sediments of the Perth Basin consist of coastal dune, beach, shallow marine and alluvial sediments from the Pleistocene to Recent, namely the superficial Yoganup and Guildford formations. The superficial formations disconformably overly coarse, angular sand sediments of Mesozoic age. At Burekup these Mesozoic sediments comprise the Leederville Formation, which is generally referred to as basement. Below the Leederville Formation lie the Bunbury Basalt, Yarragadee Formation and Cockleshell Gully Formation (Parsons Brinckerhoff (PB), 2007).

The Burekup deposit is hosted within the superficial formations. The deposit consists of one Heavy Mineral (HM) strand which is subdivided into a Southern Unit and Northern Unit. The mineral assemblage of the Southern Unit is dominated by clean altered ilmenite and leucoxene and increases in HM grade from north to south. The Northern Unit is characterized by high slimes, with a mineral assemblage that consists of clay and iron-coated ilmenite, and rock. Additional low grade mineralisation exists at surface which is predominantly composed of leucoxene.

The Guildford Formation is generally present as a continuous unit over the site, ranging from 6 metres thick in the centre of the deposit to 20 metres thick to the west. The Yoganup Formation ranges from 1 metres to 6 metres thick across most of the orebody, with a maximum thickness of 11 metres in the Southwest (PB, 2007). In the north of the site, the Yoganup Formation contains clay levels similar to Guildford Formation clay levels (N. Northcott, pers. comm.). The Leederville Formation is absent to the north of the site and to the West, over Bunbury Basalt. Basalt is not known to be present beneath the Burekup deposit (PB, 2007).

5.4. Landforms & Soils

The Project is located on the northern surface of the Ferguson River piedmont, an area of flat to gently undulating land with small localised rises separated by broad low-lying depressions (Wells, 1989, cited in Soil Water Consultants (SWC), 2007a). The depressions experience seasonal inundation and waterlogging. Very little height difference exists between the rises and low-lying depressions, however more pronounced dissection occurs along drainage lines on the eastern side of the Project. The surface elevation varies from 25 metres on the western side to 35 metres on the eastern side. The general aspect is north west (SWC, 2007a). The Collie and Ferguson Rivers are located 6 kilometres to the north and 3 kilometres to the south of the Burekup site respectively and form the dominant river systems in the region. Henty Brook and Paradise Creek represent smaller systems, located approximately 3 kilometres north and 350 metres south of the site.

The findings of previous regional soil surveys are discussed in SWC (2007a) and summarised below. As the site occurs on the Pinjarra Plain, the soils consist primarily of poorly drained clayey soils of the Guildford Formation. The dominant soil type on the site consists of acidic yellow, grey and brown gradational earths and mottled duplex soils subject to inundation and waterlogging. Clayey soils on the eastern side of the site are overlain by shallow pale grey sand and sandy loam, forming a well defined duplex soil profile, facilitating perching and waterlogging near the surface (SWC, 2007a).

A baseline soil survey was conducted over the site by Soil Water Consultants (SWC, 2007a). The survey involved shallow and deep trench excavation to investigate soils across the site. Four distinct Soil Mapping Units (SMU) were defined during the survey.

5.4.1. Soil Mapping Units

The soil mapping units mapped over the Project are shown in Figure 6 and describe below.

SMU1: Uniform Brown Heavy Clay

This SMU occurs in two isolated areas within the site and likely represents the basal portion of remnant stream channels through the area (see Figure 6). The soil extends from the surface to depths of up to 4 metres and is deposited directly onto the blue-grey sandy clay soils of the Guildford Formation.

The topsoil is structurally degraded, resulting in slaking and dispersion, causing the soils to hardset. The underlying brown clay soils are well structured and abundant roots occur throughout. This material is moderately saline with a relatively high sodicity and poor structural stability. The blue-grey sandy clay soils of the Guildford Formation occur beneath the brown clay and shows signs of shrink-swell properties.

SMU2: Gradational Pale Grey Sand – Yellow Sandy Loam

This SMU is restricted to areas of higher elevation in the northeast (see Figure 6). The surface soils consist of 10 to 40 cm of pale grey sand grading into a bright yellow to mottled yellow sandy loam at depth. These soils are not structurally degraded like those of SMU1. The surface soils exhibit a sandy texture with little clay and therefore are well drained and friable. There is a clear boundary between the surface sandy soils and the underlying blue-grey sandy clay soils of the Guildford Formation.

SMU3: Pale Grey – Brown Sandy Duplex

This SMU is isolated to the northeastern margin of the proposed main minepit (see Figure 6). It consists of a pale grey – brown sand overlying the blue-grey sandy clay soils of the Guildford Formation with an abrupt textural boundary. The sandy surface soils have a very low water holding capacity and subsequently they become saturated in winter months with water perching on the clayey soil below, and drying rapidly in spring. The defined duplex boundary facilitates perching and subsequent lateral flow of water, which has implications for the formation of surrounding areas of inundation. It is likely that these soils have formed in depressions on the upper surface of the underlying Guildford Formation.

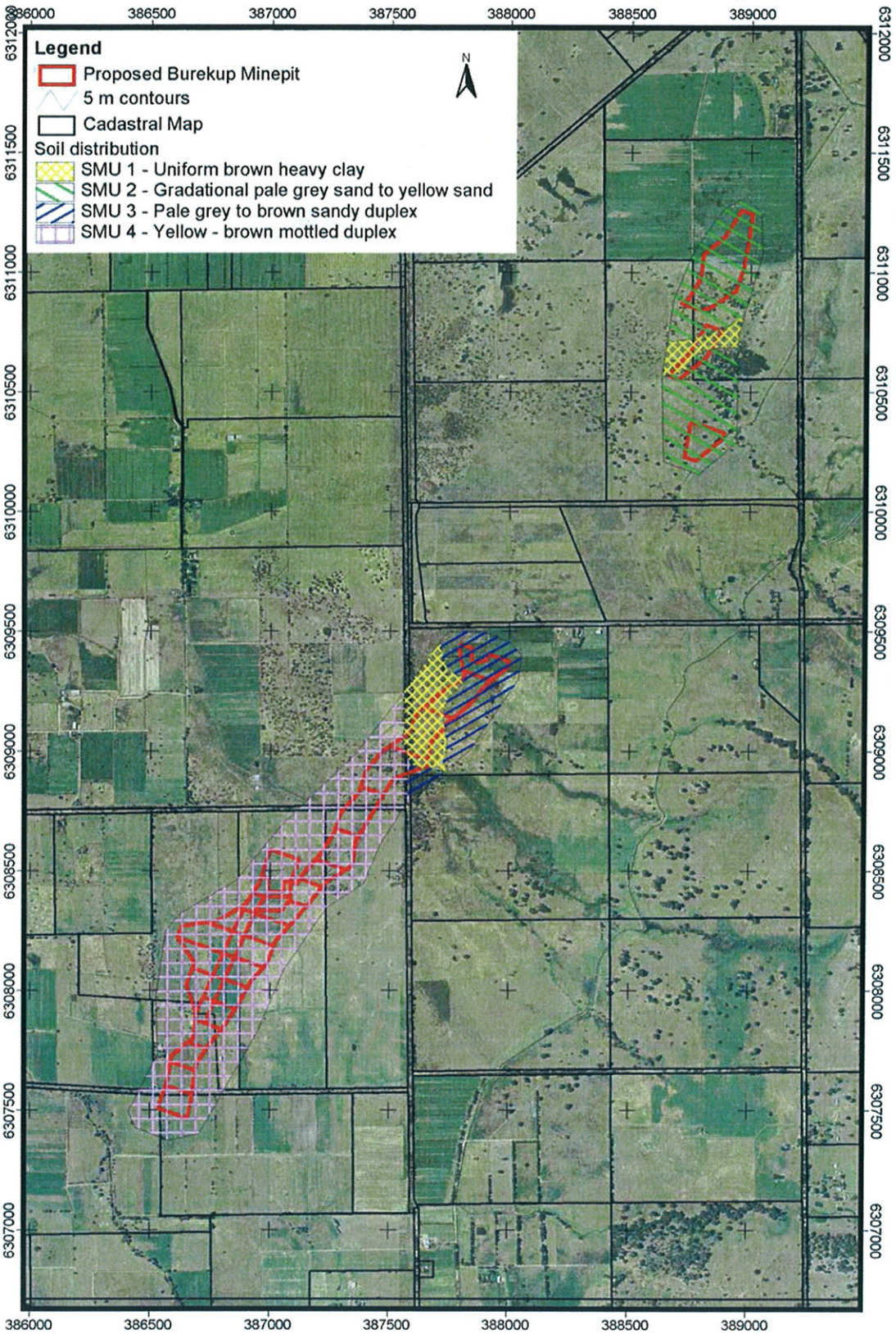
SMU4: Yellow – brown Mottled Duplex

This is the most dominant SMU in the site (see Figure 6). The bright yellow to brownish orange surface soils overlying the Guildford Formation are coarser than those in SMU1 and therefore better drained. Again, the boundary between the surface soils and the Guildford Formation is abrupt, indicating a depositional, rather than pedogenic, mode of formation..

The topsoil has a sandy clay texture which is structurally sensitive. These soils slake rapidly when rewet and show moderate dispersion resulting in hardsetting. Cultivation of these soils is also likely to enhance hardsetting, and considerable shrink-swell properties are observed.

The subsoil consists of bright yellow sandy clay with a very good structure and firm crumb peds. It is less dispersive (due to iron oxides) with a relatively high plant available water content.

It is important to note that the clayey Guildford Formation underlies all surface soils across the site. The Guildford clay remains unsaturated throughout the majority of the year, as evidenced by the extensive mottling and laterisation. Water movement through the clayey matrix is extremely slow, however preferential flow does occur through isolated coarse sandy lenses.



PN	PN0094-1-1-IR-069	
Prep. by	ASP	02/05/07
Rev'd. by	AJH	02/05/07
Revision No.		1

Iluka Resources Limited
BUREKUP MINESITE PRE-MINE SOIL SURVEY
SMU DISTRIBUTION

Figure 6

5.5. Groundwater

The Project is partially situated within the Dardanup Groundwater Management Sub-area of the Bunbury Groundwater Area, and partially within unproclaimed groundwater area, with Dowdells Line Road the boundary (PB, 2007) (Figure 7).

An initial study was conducted in 2006 to characterise the local groundwater environments based on knowledge of the local geology and groundwater systems and experience at other Iluka deposits in the region (PB, 2006). As part of these investigations, five monitoring piezometer pairs and six shallow piezometers were installed in April 2006.

The deposit lies within the superficial formations which are made up of the Guildford Formation and Yoganup Formation. The superficial formations are underlain by the Leederville Formation and the Yarragadee Formation (PB, 2007). The Superficial and Leederville aquifers are described below.

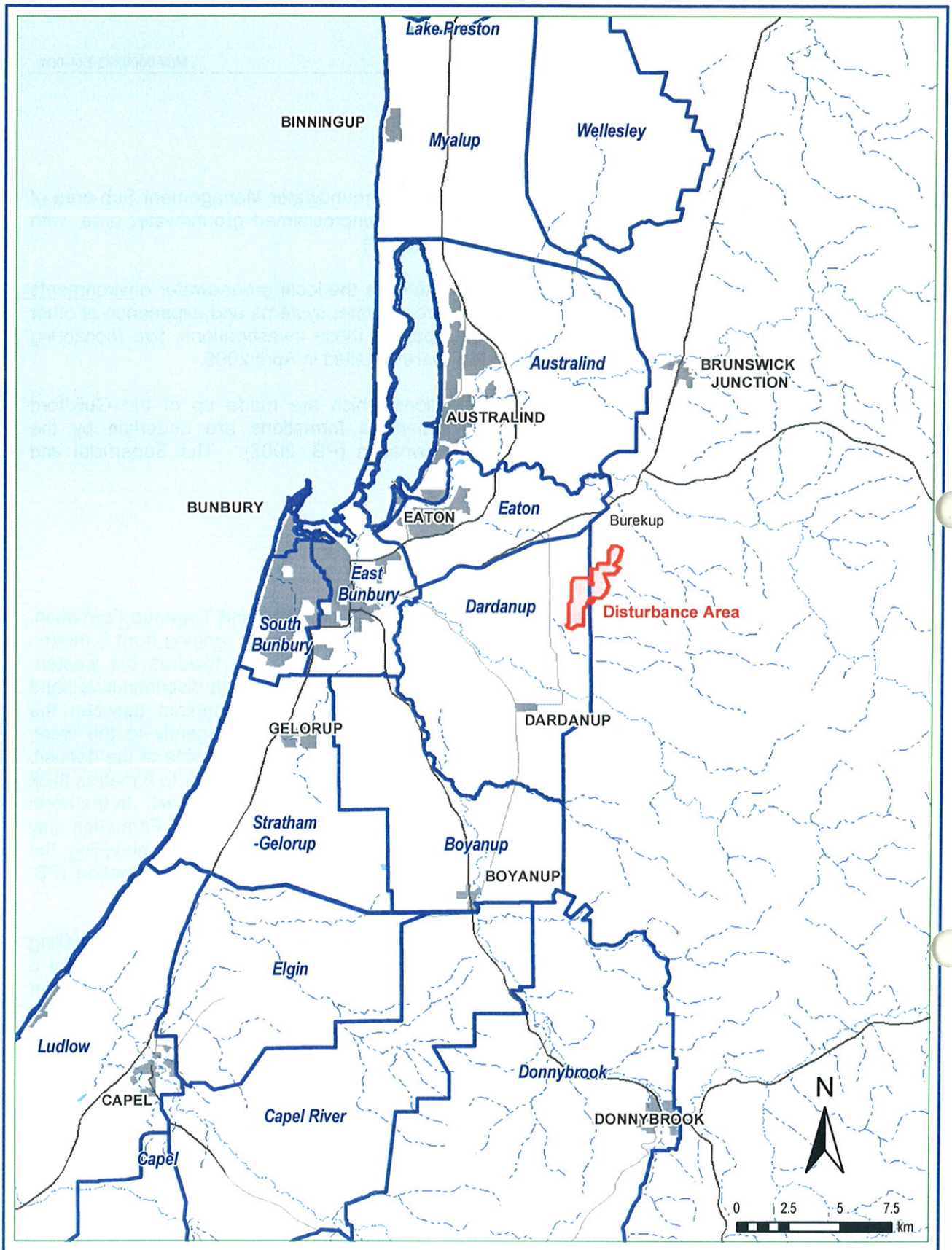
5.5.1. Aquifer systems

Superficial Formations

The superficial formations are made up of the Guildford Formation and Yoganup Formation. The Guildford Formation is a continuous unit over much of the site, ranging from 6 metres thick in the centre of the deposit to an average 20 metres thick towards the western boundary. The formation is mainly comprised of clay and silt, although discontinuous sand lenses represent isolated areas of enhanced permeability. The contact between the Guildford Formation and the underlying Yoganup Formation slopes gently to the west, ranging from 28 mAHD closest to the scarp to 8 mAHD on the western side of the deposit. The Yoganup Formation is sand dominated and ranges from 1 metres thick to 6 metres thick across most of the deposit, but reaches 11 metres thickness in the Southwest. In the north of the site, the Yoganup Formation contains clay levels similar to Guildford Formation clay levels (N. Northcott, pers. comm.), therefore for the purposes of groundwater modelling, the Northern extent of the Yoganup Formation is considered to be Guildford Formation (PB, 2007).

The superficial formations contain limited groundwater resources. Groundwater modelling indicates that the hydraulic head in the superficial aquifer is between 0.1 metres and 6 metres below ground level, with some surface areas being inundated during the winter months. Transmissivities range between 0.5 m^2/day to 79.1 m^2/day. The highest transmissivities represent the sandy Yoganup Formation. The high clay content of the Guildford Formation results in ponding during winter. Groundwater flow is generally toward the coast (north-west), mimicking the topography (PB, 2007).

The superficial aquifer is directly recharged by rainfall and localised upward leakage from underlying aquifers. Discharge from the aquifer occurs as baseflow to surface drainage, coastal wetlands, rivers, evapotranspiration and downward leakage (PB, 2007).



Legend

- Disturbance area
- Ground Water Subareas

BUREKUP

GROUNDWATER MANAGEMENT AREAS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:250,000 (A4) DATE: 23 Nov. 2007 DWG No: 176623 ver.02

FIGURE: 7

Leederville Formation

The contact between the superficial and Leederville Formations slopes gently north-west, ranging from 26 mAHD near the scarp to 4 metres AHD on the western side of the deposit (PB, 2007).

The Leederville Formation is absent to the north of the site, and thins and pinches out toward the west over the Bunbury Basalt, though there is no known basalt beneath the deposit. The formation overlaps the Darling Fault to the east. The Leederville aquifer is between 150 and 200 metres thick. Beneath the Leederville Formation lies the Yarragadee Formation (PB, 2007).

Hydraulic heads measured in piezometers screened in the Leederville aquifer are similar to those in the superficial aquifer. The transmissivity of the Leederville Formation ranges between 4.9 m^2/day to 46 m^2/day and also flows north-west, toward the coast. This aquifer is hydraulically isolated from the superficial aquifers in areas where a grey clay and silt horizon is present, however where this horizon is absent, there may be some connectivity between the formations, leading to upward leakage (PB, 2007).

Regional Leederville recharge is from infiltration of rainfall on the Blackwood Plateau to the south and localised downward leakage from the superficial aquifer or upward leakage from the Yarragadee aquifer. Discharge is to the superficial and Yarragadee aquifers and the ocean (PB, 2007).

5.5.2. Groundwater supplies

The Burekup deposit is partially situated within the Dardanup Groundwater Management Sub-area of the Bunbury Groundwater Area, and partially within unproclaimed groundwater area, with Dowdells Line Road the boundary. The Bunbury Groundwater area is a gazetted groundwater area, with the conservation, management and protection of all water resources vested in and administered by the State in accordance with the *Rights in Water and Irrigation Act 1914*, as amended. The current allocation limit for the Dardanup sub-area superficial aquifer is 500,000 kL/annum, of which 7% (35,000 kL) is currently allocated.

5.5.3. Groundwater quality and quantity

Groundwater quality in the superficial formations ranges from fresh to brackish, depending on the proximity to recharge areas and the local lithological composition (PB, 2007).

Groundwater levels in the piezometer network have been monitored monthly since August 2006 and seasonal fluctuations of up to 2.83 metres within a piezometer have been observed to date. Quality in the piezometers has been monitored quarterly since December 2006. Variations of greater than one pH unit and up to 4140 μScm^{-1} have been observed within piezometers to date.

5.5.4. Local Groundwater Users

Iluka conducted a groundwater resource census of 20 landowners within approximately one kilometre of the deposit, collecting information on bores and dams. 22 bores and 10 dams were noted. All dams are fed by windmills, bores or surface flows. Bore construction and groundwater level information available was limited. Bores and dams are used for stock watering, irrigation, dairy and household purposes.

5.5.5. Conceptual Groundwater model

Groundwater flow modelling was conducted using MODFLOW 2000. A conceptual model was developed, summarising the current groundwater system and any stressors acting on the system. This model is based on information derived from previous investigations at the site, including exploration drilling, aquifer testing and soil and vegetation studies (PB, 2007).

The assumptions and limitations of the model are outlined in the groundwater report (PB, 2007). Initial models were run in steady-state mode in order to calibrate the modelled potentiometric surface against observed hydraulic head. Predictive models were run using an initial steady state stress period to achieve equilibrium, then 61 transient stress periods to simulate the transient effects of mining on hydraulic head. The model drain schedule was based on the proposed mining schedule (PB, 2007). The model results are discussed in section 9.2 of this document.

5.6. Acid Sulfate Soil

The General Guidance on Managing Acid Sulfate Soils states that, "Acid sulfate soil is the common name given to naturally occurring soil or sediment containing iron sulfides over extensive low lying areas under waterlogged or highly reducing conditions (i.e. anaerobic conditions). These soils may be found close to the natural ground level but may also be found at depth in the soil profile. When sulphides are exposed to air, oxidation takes place and sulphuric acid is produced when the soil's capacity to neutralise the acidity is exceeded" (DoE, 2003, pg 1).

Actual Acid Sulfate Soils (AASS) and Potential Acid Sulfate Soils (PASS) are collectively known as Acid Sulfate Soils (ASS). AASS are soils or sediments which contain iron sulfides and/or other sulfidic minerals that have previously been oxidised to produce sulphuric acid. These soils have pH values < 4. In contrast, PASS contain unoxidised iron sulfides and/or other sulfidic minerals (DoE, 2006, cited in SWC, 2007b).

Other Potentially Problematic Acid-generating Substrates are also grouped with ASS under the draft guideline (DoE, 2006), including:

- Recent Sand Units – Pale Grey Sands and Iron Cemented Organic Rich Sands (Coffee Rock) which may contain inorganic sulfides (e.g. pyrite and iron monosulfides) and easily hydrolysable iron and manganese oxides; and
- Dredge spoil, which may contain significant quantities of iron sulphide minerals (pyrite and iron monosulfides).

A survey has been conducted to determine the presence or absence of ASS within the Project, including the proposed mine pits and the immediate surrounds (SWC, 2007b). The survey was consistent with the procedure outlined in the *Draft identification and investigation of acid sulfate soils guideline* (DoE, 2006), with some variance to enable application of this document to a mineral sands deposit. Other sources utilised in the survey were:

- Treatment and management of disturbed acid sulfate soils (DoE, 2004)
- Acid sulfate soils manual (Stone et al., 1998)
- Analysis of acid sulfate soils – Part 1: Dried sample – Pre-treatment of samples (Standards Australia, 2006)

- Preparation of acid sulfate soil management plan (ASSMP) (DoE, 2003)

The survey involved:

- A desktop assessment of the Project to determine the potential for ASS to occur in the region, including review of existing literature and ASS risk maps (WAPC, 2003), and constructing a detailed geological model of the deposit based on exploration drilling data.
- A site inspection to identify indicators of ASS occurrence, e.g. iron staining, salt or water tolerant vegetation and jarosite coatings.
- An extensive ASS drilling, soil sampling and analysis program undertaken in March 2006 to identify the occurrence of AASS and PASS across the site and through the soil profile.
- Construction of a 3D S_{CR} distribution model for the Burekup mine area showing the spatial extent and abundance or pyrite (PASS) in this region
- Laboratory leaching trials to assess the potential risk that hydrolysis of non-pyritic soils may have on metals release to the environment
- Propose strategies for the management of ASS within the Project.

A third party review was undertaken on the ASS investigation (Sullivan, 2007). Changes were made to the model based on recommendations from this review (SWC, 2007c).

The desktop assessment identified that the Project includes areas likely to contain ASS. This is supported by the ASS risk maps (WAPC, 2003). The maps showed no areas of high risk in the surface 3 metres, however do suggest a low to moderate risk of both AASS and PASS occurring at depths > 3 metres in the soil profile. The presence of ASS at these depths is generally associated with previous estuarine conditions formed during marine regression and transgression events on the Swan Coastal Plain, which also favour the deposition of heavy minerals.

The site inspection aimed to identify soil, water and vegetation indicators that may assist in determining whether AASS or PASS occur at the site. The landsurface is very gently undulating with heavy surface soils and there is evidence of surface ponding. Assessment of soils on the surfaces of drains showed no signs of iron staining, scalding or jarosite formation. Surface waters are slightly acidic – neutral (5.5 – 6.5) (SWC, 2007, cited in SWC, 2007b). Vegetation consists of Jarrah and Marri trees along sandy rises and paperbarks and sedges along low-lying areas, with no tree deaths evident (SWC, 2007b).

The site inspection, like the desktop assessment, suggests that no AASS or PASS occur within the surface 3 metres of the Project. If present, ASS is likely to be at depths greater than 3 metres and associated with previous estuarine conditions.

A review of the geological and metallurgical data collected during exploration drilling was undertaken to assist in review of the potential for ASS at depth. Exploration drilling was to a final density of 27 holes/ha, with soil samples collected at 1 metres vertical intervals along the length of the drillhole, which ranged from 15 to 30 metres in depth and typically extended into the Leederville Formation beneath the Yoganup Formation which hosts the ore. A total of 25,184 exploration soil samples have been collected and analysed for the following geological/soil parameters:

- Soil texture (% fines: < 53 µm fraction; % sand: 53 – 750 µm fraction; % coarse sand: 750 – 2000 ; % oversize: > 2000 µm fraction)
- Lithology/stratigraphy
- Soil colour
- Heavy mineral content

Metallurgical properties including % total S, mineralogy and elemental composition were also analysed on selected samples from each stratigraphic zone (i.e. Guildford Clay, Yoganup Formation, Leederville Formation).

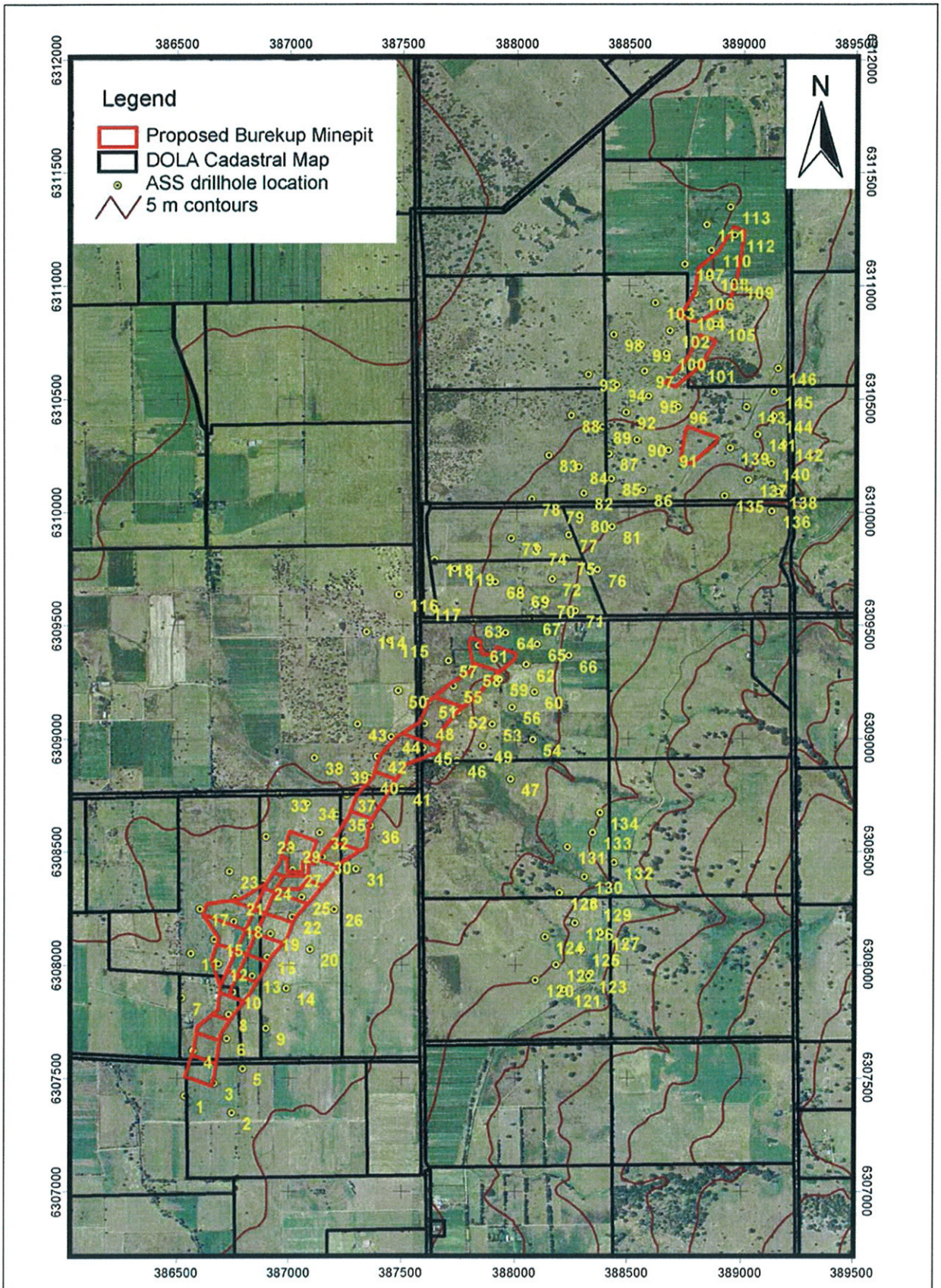
This data has been calibrated with actual soil morphological, physical and chemical properties to a maximum depth of 11 metres by comparison with soil profile properties determined during soil surveys (SWC, 2007a). A good relationship exists between the exploration drilling data and the soil characteristics as determined by soil survey (excavating deep soil trenches).

From the exploration drilling data, soil colour was used to identify the redoximorphic status of the soils and soil colour and texture was used to identify the presence of any peaty, organic rich layers (potential ASS or monosulfidic material). Extensive areas of black sand – clay soils occur beneath the proposed mine pit (SWC, 2007). This suggests the presence of ASS.

Following the review of exploration drill data, an ASS drilling and sampling program was undertaken to confirm the presence or absence of ASS in the proposed mine area. A total of 146 holes were drilled, at a density of 3.2 holes/ha (Figure 8). The depth of drilling varied from 7 to 20 metres, with an average depth of 15 metres, and all holes extended at least 2 metres below the base of the proposed mine pit. Samples were collected at 1 metres vertical intervals over the length of each drillhole (a total of 2054 samples). Each sample was analysed for Field pH (pH_F) and field peroxide (pH_{FOX}). All samples with a pH_F < 4.0 were analysed for Total Actual Acidity (TAA) and Chromium Reducible Sulfur (S_{CR}) analysis was conducted on 100 samples, selected from each geological unit and covering a wide range of pH_{FOX} values. Leaching trials were also conducted on 16 non-pyritic soils (S_{CR} < 0.03%) from a range of depths to determine potential hydrolysis and metals release characteristics of selected samples.

The pH_F results varied from 4.13 to 8.83, with 94% of all soils sampled having a field pH value between 5.0 and 7.0 (i.e. moderately to slightly acidic). These values are typical for the Swan Coastal Plain (McArthur, 1991, cited in SWC, 2007b). Approximately 6% of the samples had pH_F values between 4 and 5 (moderately to strongly acidic) and the majority of these samples were associated with surface soils and are likely due to agricultural practices, not AASS. No soil samples had pH_F values < 4.0, therefore no AASS are likely to occur at this site and no further analysis of AASS has been undertaken.

The pH_{FOX} results varied from 1.62 to 8.22, with 75% of samples having pH_{FOX} values > 4.0, consequently they are not considered PASS. Approximately 25% of the soils tested had pH_{FOX} values < 4.0, indicating the possible presence of PASS. Nine per cent had pH_{FOX} values between 2.0 and 3.0, whilst only two per cent had a pH_{FOX} value between 1 and 2. The presence of pH_{FOX} values less than 3.0 indicates that PASS are likely to be present in the site.



PN	PN0074-1-5-IR-064	
Prep. by	ASP	02/05/07
Rev'd. by	AJH	02/05/07
Revision No.		1

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BUREKUP ASS SURVEY
ASS DRILLHOLE LOCATIONS

Figure 8

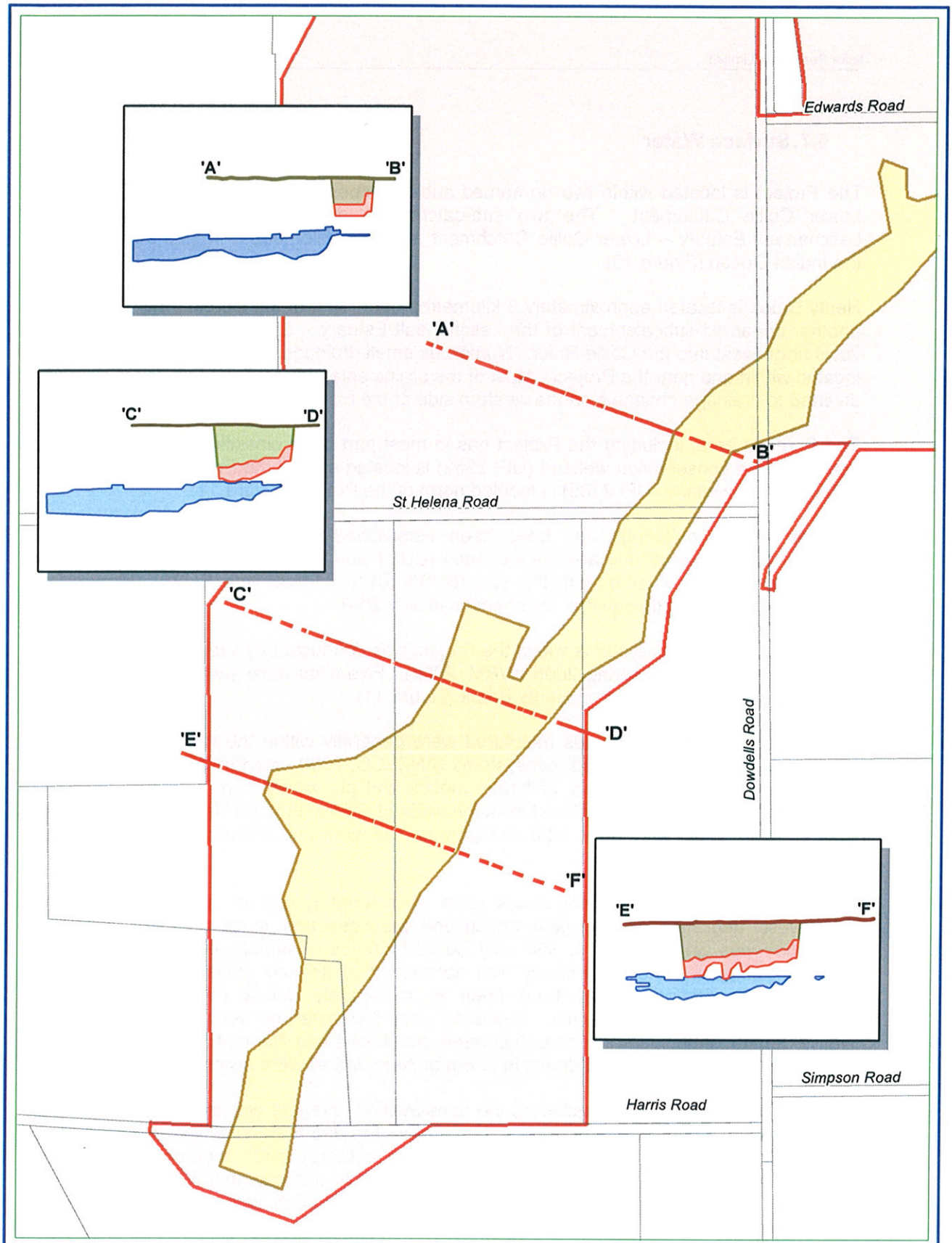
SWC

The S_{CR} results varied from < 0.01 – 2.98%. The critical % S_{CR} content for a PASS is 0.03% S, therefore pyrite exists in some soils sampled at Burekup. The relationship between pH_{FOX} and S_{CR} values was examined and a very good relationship was observed (r^2=0.96). However, the third party review noted that this correlation was influenced by the small number of S_{CR} values greater than 0.5% (Sullivan, 2007). Using the pH_{FOX} / S_{CR} relationship, pH_{FOX} values for all 2,054 samples were converted to S_{CR} values to estimate the pyrite content in all soils. The resultant S_{CR} values varied from < 0.01 to > 10%, indicating that considerable PASS occurs in the vicinity of the Burekup site. Using the relationship determined between S_{CR} and pH_{FOX} at Burekup, the S_{CR} action criteria of 0.03% equates to a pH_{FOX} value of 2.31. In modelling the PASS distribution, a conservative pH_{FOX} value of 2.66 was used. This value represents the highest pH_{FOX} value with a measured S_{CR} value greater than 0.03%, as recommended by Sulivan (2007) (SWC, 2007c). The modelled distribution of PASS at Burekup, using a PASS indicator of pH_{FOX} equal to 2.66 are shown in Figure 9.

Using the conservative pH_{FOX} cutoff of 2.66 to indicate the presence of PASS, modelling suggests that while considerable PASS occurs in the vicinity of the Project, all PASS material occurs in the Leederville Formation underlying the proposed mine pit. Consequently, no PASS material will be directly disturbed by mining (i.e. excavated) at this site and no PASS-specific management practices are required for excavated material. However, PASS soils (pH_{FOX} soils < 2.66) do occur within 1 metres of the base of the proposed mine pit (SWC, 2007b).

5.6.1. Heavy metal content and leaching

Heavy metal leaching trials showed that the soils in the Project area have low levels of heavy metals compared to the National Environment Protection Council (NEPC) Ecological Investigation levels (EIL). All samples had total metal contents considerably less than the EIL except for one soil (the blue grey sandy clay from 2-3 metres depth) which had a Chromium content equal to the EIL. The release characteristics of these metals, and thus their leachability, were investigated by leaching with both a neutral solution (to simulate natural rainfall conditions) and an highly acidic solution (to simulate acidic leachate conditions that may occur following hydrolysis of iron-oxide minerals). Leaching with the neutral (pH=6.40) 0.01M CaCl2 solution was expected to remove only the readily exchangeable metals whilst the strongly acidic (pH=2.5) 0.01M $CaCl_2$ was expected to remove some of the structural metals within the soil crystal structure. The leachability of the metals varied considerably. Chromium, Cadmium and Lead were strongly held by the soil and very little was leached, with less than 5% of the total soil metal content being leached, implying that these metals were predominately structural metals. In contrast, Copper, Zinc and Nickel were freely available with up to 50% of the total soil metal content being leached from the various soils. No significant difference was observed between the metal content of the neutral or acidic 0.01M $CaCl_2$ solutions, suggesting that the majority of metals released were removed only from the exchange sites on the soil (SWC, 2007b).



Legend

- Cross Sections
- Cadastre
- Mine Pit
- Disturbance Area

Cross Sections

- Ground Level
- Over Burden
- Ore Zone
- Pass Material

BUREKUP

PASS CROSS SECTIONS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:10,000 (A4) DATE: 14 Nov. 2007 DWG No: 178420 ver.00

FIGURE: 9

5.7. Surface Water

The Project is located within two un-named sub-catchments of the Leschenault Estuary – Lower Collie Catchment. The two sub-catchments drain to the Collie River. The Leschenault Estuary – Lower Collie Catchment is 914.65 kilometres^2 in size and drains to the Indian Ocean (Figure 10).

Henty Brook is located approximately 3 kilometres north east of the Burekup mine pit within another unnamed subcatchment of the Leschenault Estuary – Lower Collie Catchment and flows north west into the Collie River. Numerous small drainage and irrigation channels are located within and near the Project. Most of the drains entering the Project from the east are diverted to drainage channels on the western side of the mine pit.

The Burekup area, including the Project has in most part been classified as a multiple use wetland. One conservation wetland (UFI 2362) is located east of the Project. One resource enhancement wetland (UFI 2165) is located north of the Project (Figure 11).

Surface water monitoring sites have been established at the resource enhancement category and conservation category wetlands (BUS1 and BUS2 respectively), and at four sites where drains enter or exit the site (BUS3, BUS4, BUS5 and BUS6) (Figure 11). Monthly monitoring at these sites commenced in July 2007.

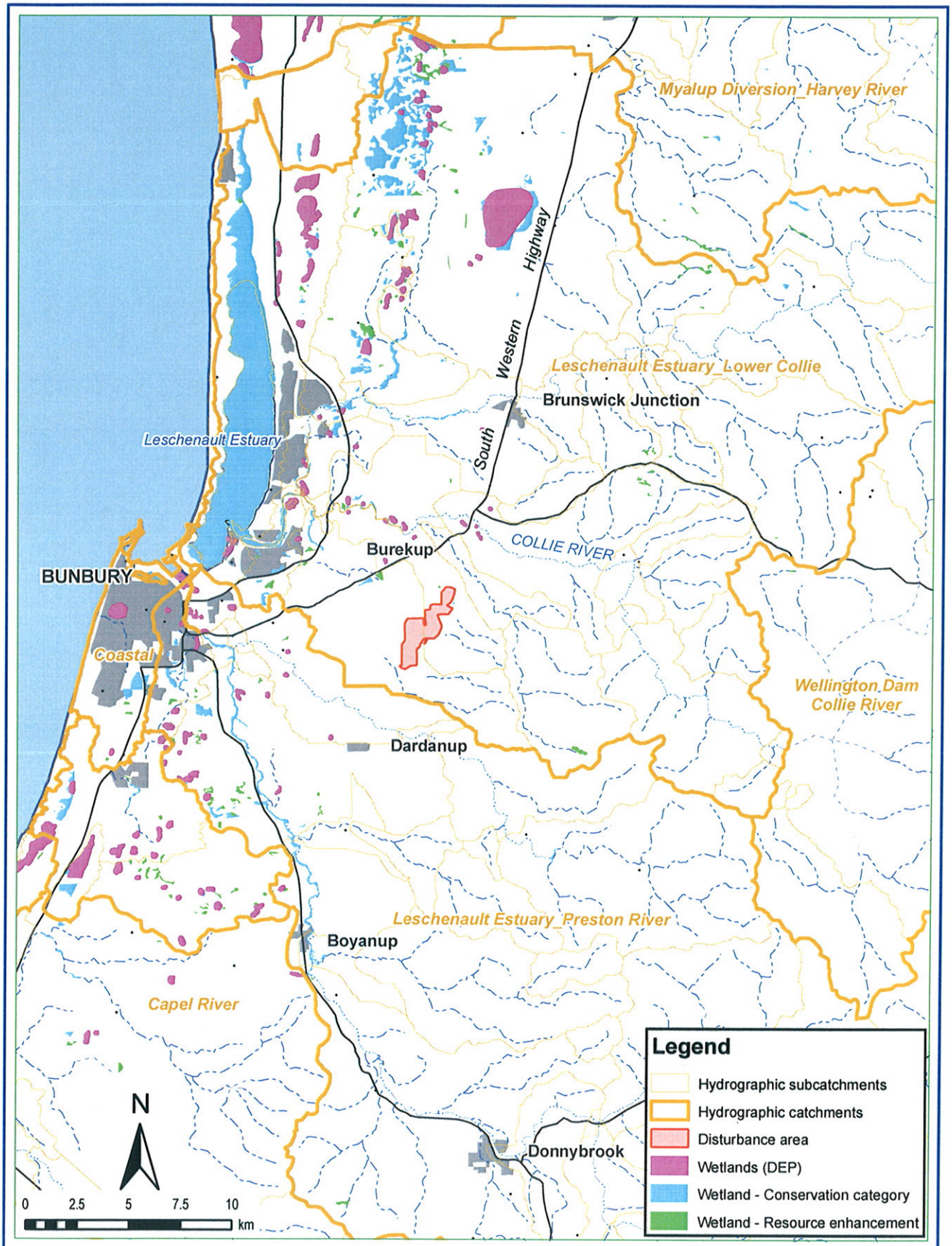
A survey of aquatic ecosystems within the Project was conducted by Wetland Research and Management (WRM) in spring 2005 (WRM, 2006). Five sites were sampled, including two wetland sites and three sites on Henty Brook (Figure 11).

Physical and chemical variables measured were generally within the ranges expected for 'slightly to moderately disturbed' ecosystems (ANZECC, 2000, cited in WRM, 2006). Sites B3 and B9 showed high levels of heavy metals and pH varied from 6.15 to 7.49. The riverine sites of Henty Brook differed from the wetland sites in that the Henty Brook sites had greater water depth and lower total phosphorus, cadmium and electrical conductivity than the wetland sites.

The riverine sites along Henty Brook were considered typical of rural regions in the Southwest, degraded due to past agricultural practices and stock access. In-stream vegetation was virtually absent, with only isolated clumps of submerged macrophytes and emergent sedges. The understorey was dominated by pasture grasses and weeds and overstorey vegetation ranged from open to moderately dense mixed woodlands of peppermint and Eucalypt species. Wetlands were dominated by *Melaleuca* over pasture. Native vegetation included sedges, duckweed, pondweed and filamentous algae. Some of the wetland sites sampled had drains in or out of them and all were accessible to cattle.

A further four wetland sites, including the conservation category wetland and the resource enhancement category wetland (Figure 11) were visited and their condition assessed using EPA Bulletin 686 (1993). Both the conservation category and resource enhancement category wetlands were considered equivalent to multiple use category wetlands given the degree of rural activity, extent of clearing, degradation through cattle access and lack of understorey.

The survey identified resident fauna to the lowest possible taxonomic level, compared biodiversity and invertebrate assemblages amongst sites and related differences in fauna to differences in water quality. Aquatic fauna communities at all sites were dominated by cosmopolitan species, typical of lowland rural regions.

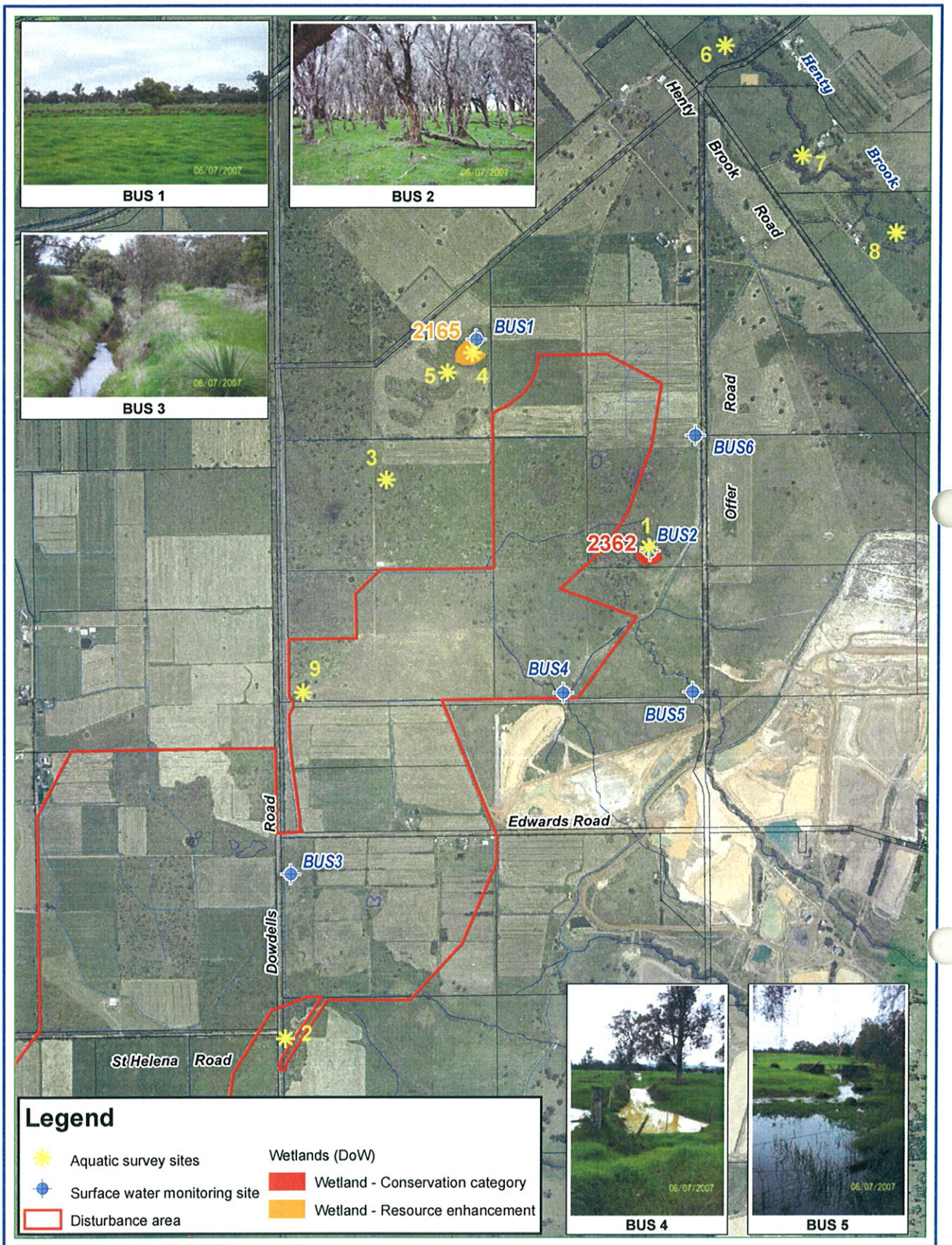


BUREKUP REGIONAL SURFACE WATER CATCHMENTS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:250,000 (A4) DATE: 23 Nov. 2007 DWG No: 176620 ver.02

FIGURE: 10



Aerial Photo Detailed - Nov. 2005
Aerial Photo Regional - Skyview 2001

N

0 250 500 750 1,000 Meters

BUREKUP

LOCAL SURFACE WATER SYSTEMS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 23 Nov. 2007 DWG No: 176622 ver.02

FIGURE: 11

The survey recorded a total of 119 macroinvertebrate taxa, a moderately diverse fauna for seasonal waters. Composition was similar to other disturbed watercourses on the coastal plain. Numbers of taxa recorded at each site varied greatly within the riverine sites (from 23 to 68) and wetland sites (29 to 57) sampled. 51% of the species found occur across Australia and overseas. 12% were endemic to the Southwest, but none of these are considered rare or restricted. Three taxa (2.5%) were new records for Western Australia or new to science. They were the rotifers *Dicranophoroides caudatus* and *Filinia cf. passa* and an indeterminate Difflugiid Rhizopod.

While some of the aquatic invertebrate species recorded from Burekup are Southwest endemics, none are restricted to the Burekup wetlands. Nor are the species recorded as new to Western Australia likely to be restricted to the Burekup wetlands (Sue Creagh, Senior Research Officer, WRM, 24/05/2007, pers. comm.).

The Rotifers *Dicranophoroides caudatus* and *Filinia cf. passa* had not previously been recorded in Western Australia when they were found in site B3, a wetland west of the disturbance area. *Dicranophoroides caudatus* is known from 6,500 localities world-wide but to date has been recorded from only six sites within Australia. However, given the distribution of these sites: Jabiluka in the Northern Territory, the Murray River at Wodonga, Victoria, the Goulburn River at Alexandra, Victoria and Burekup, Western Australia, it is probable that the species is pancontinental and it is likely that the limited records in Australia are due to limited sampling effort applied to microinvertebrates and misidentification. Due to the limited sampling to date, it is not uncommon to produce records of new taxa. The same is likely for *Filinia cf. passa*. There are at least 20 verified records of this species across Australia, from all states except Tasmania. The indeterminate difflugiid is probably undescribed, given the low level of research on testate Rhizopoda in Australia. Whether it is more widely distributed is unknown given this lack of research. It is likely that it is more widely distributed but yet to be recorded elsewhere (Russell Shiel, Visiting Research Fellow, University of Adelaide, cited by Sue Creagh).

Also of note was the stonefly collected from one site on Henty Brook and two species of hydrophild beetle and two introduced species. The Plectoptera *Newmanoperla exigua* is endemic and restricted to the far Southwest corner of WA and are typically regarded as ecologically significant, owing to their high sensitivity to water quality. *Enochrus samae* and *Berosus gibbae* recorded at Burekup both represent known range extensions and the gastropod *Lymnaea stagnalis* and the Simulid *Simulium ornatipes* are both introduced species.

As expected, the faunal assemblages within the wetland sites differed from that within the riverine sites, however, the most upstream riverine site (B8) was also found to differ from the other riverine sites, with a higher taxa richness at this site.

The survey also recorded two native fish species (the Nightfish and Western Pygmy Perch), one introduced fish species (Mosquitofish), one freshwater crayfish (the gilgie), three species of frog (*Crinia insignifera*, *Crinia glauerti*, and *Litoria adelaidensis*), and eight bird species (the Pacific Black Duck, Australian Wood Duck, Chestnut-breasted Shelduck, Straw-necked Ibis, White-faced Heron, Cattle Egret, Yellow-billed Spoonbill and Sacred Kingfisher). All of these species are common in the Southwest.

The vegetation in these areas was assessed as part of the vegetation survey undertaken by Mattiske Consulting Pty Ltd, outlined in section 5.8.

5.8. Vegetation and Flora

The vegetation and flora within the area proposed for disturbance and its surrounds (the Study Area) were surveyed by Mattiske Consulting Pty Ltd (2006). The requirements of the EPA Guidance Statement 51: Terrestrial Flora and Vegetation Surveys (EPA, 2004e) were incorporated into these surveys. The specific work included a search for declared rare flora (DRF) and priority flora (PF), defining and mapping the plant communities present, assessing the condition of the plant communities and reviewing the local and regional conservation value of the flora and vegetation.

The survey was conducted in early December 2005. EPA Guidance Statement 51 (EPA, 2004e) states that the primary flora and vegetation survey should be conducted following the season which normally contributes the most rainfall in the bioregion. Within the Southwest Botanical Province, the highest season of rainfall is winter, however, unseasonably cool and wet spring weather was received in 2005 and as a result December was identified as being within an optimal range for surveying at Burekup. Further, in the southern sections of the Swan Coastal Plain the spring season extends over several months as the conditions are cooler thereby allowing annual species to persist. The findings of this survey are summarised below.

5.8.1. Flora

In the flora and vegetation surveys conducted by Mattiske Consulting Pty Ltd (2006, 2007), a total of 199 taxa (including subspecies and varieties) from 139 genera and 53 families were recorded within the Burekup study area. Representation was greatest among the Poaceae (28 taxa), followed by Papilionaceae (18 taxa), Myrtaceae (16 taxa), Cyperaceae (15 taxa) and Mimosaceae (11 taxa). 24 Poaceae, 7 Papilionaceae and 3 Cyperaceae were weed species. The families with the highest native representation were Myrtaceae (16 species), Cyperaceae (12 species) and Mimosaceae (10 species).

Rare and priority flora

No Declared Rare Flora (DRF) species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950* (WC Act) and as listed by the DEC (2006a and 2006b) were located during the survey. No plant taxa pursuant to section 179 of the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act) were located in the study area. Though several PF species have previously been recorded in and near the disturbance area (Figure 12), no Priority Flora (PF) species were recorded in the study area during either survey.

Significant Species

The EPA noted in a letter to Iluka on 2 May 2007 that the study area contains the southernmost known occurrence of *Casuarina obesa* on the eastern side of the Swan Coastal Plain. The EPA therefore considers this occurrence significant. The EPA also note that a stand of *Eucalyptus wandoo* within the study area is one of the most extensive known stands of mixed age that far south on the Pinjarra Plain. The EPA also notes that the *Corymbia haemotoxylon* located within the study area could be considered a disjunct and significant population.

Introduced and Declared Weed species

A total of 86 of the 199 taxa recorded in the flora survey were introduced or weed species (Mattiske Consulting Pty Ltd, 2006). Four of the 86 species are Declared Plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976*. They were:

- *Acacia dealbata* (Silver Wattle) P1, P2;
- *Rubus fruticosus* agg. (Blackberry) P1, P4;
- *Asparagus asparagoides* (Bridal creeper) P1; and
- *Gomphocarpus fruticosus* (Narrowleaf Cotton Bush) P1, P4.

5.8.2. Vegetation

The Study Area is located within the Drummond Botanical Subdistrict of the South-western Botanical Province (Diels, 1906; Gardner, 1942; and Beard, 1979 and 1980; cited in Mattiske Consulting Pty Ltd, 2006); the Guildford vegetation complex as defined by Heddle *et al.* (1980a) and cited in Mattiske Consulting Pty Ltd, 2006; and the Swan Coastal Plain Bioregion as defined by Thackway and Cresswell (1995) and the Department of the Environment and Heritage (2006b) under the Interim Biogeographical Regionalisation for Australia (IBRA) cited in Mattiske Consulting Pty Ltd, 2006.

The Drummond Botanical Subdistrict is a low-lying coastal plain with sandy soils and swampy deposits, in a warm dry Mediterranean climate. The vegetation is typically *Banksia* low woodland on leached sands, *Melaleuca* wetlands in areas of poorer drainage, and *Eucalyptus gomphocephala / E. marginata / Corymbia calophylla* woodlands on soils with a higher nutrient content (Beard, 1990; cited in Mattiske Consulting Pty Ltd, 2006).

The Guildford vegetation complex is defined as, "A mixture of open forest to tall open forest of *Corymbia calophylla – Eucalyptus wandoo – Eucalyptus marginata* and woodland of *Eucalyptus wandoo*. Minor components include *Eucalyptus rudis – Melaleuca rhaphiophylla*." The Swan Coastal Plain Bioregion is characterised by *Banksia* sp. and *Eucalyptus gomphocephala* (Tuart) woodlands on sandy soils, *Casuarina obesa* woodlands on outwash plains (with *Corymbia calophylla* to the south), and *Melaleuca* sp. woodlands on swampy areas (DEC 2006a, cited in Mattiske Consulting Pty Ltd, 2006).

Mattiske Consulting Pty Ltd (2006) notes that the Guildford vegetation complex has been largely cleared for agricultural activities and is under represented in the conservation estate. In a letter to Iluka dates 2 May 2007, the EPA notes that within the Greater Bunbury Region of the Swan Coastal Plain, only 4.4% of the original extent of the Guildford vegetation complex remains.

The study area has been extensively cleared for agricultural purposes and contains isolated trees and several areas of native vegetation. Nine vegetation communities were recorded, as described in Table 4 and shown in Figure 13 to Figure 20.

Table 4: Vegetation communities recorded in the Study Area

Community Code	Description	Condition Rating
A1	Woodland of *Agonis flexuosa – Corymbia calophylla – Eucalyptus rudis* over weeds on loam soils along flowlines.	5

Community Code	Description	Condition Rating
C1	Woodland of *Corymbia calophylla – Eucalyptus wandoo* over *Xanthhorrhoea preissii, Hypocalymma angustifolium* and weeds on sandy-loam soils.	3, 4, 5
C2	Woodland to forest of *Corymbia calophylla – Eucalyptus rudis – Melaleuca rhaphiophylla – Melaleuca preissiana* over weeds on loam soils.	3, 4, 5
C3	Low woodland of *Casuarina obesa* over *Melaleuca viminea* subsp. *viminea* and *Hakea varia* over *Chorizandra enodis* on sandy loam soils.	4, 5
C4	Forest of *Corymbia calophylla* over *Banksia grandis*, *Xanthorrhoea preissii* and *Kingia australis* over *Cyathochaeta avenacea* on sandy loam soils.	4
C5	Woodland to forest of *Corymbia calophylla – Corymbia haemotoxylon* over *Xanthorrhoea preissii* over *Cyathochaeta avenacea* on sandy loam soils.	5
E1	Woodland of *Eucalyptus wandoo* over *Melaleuca rhaphiophylla* over pasture on loam soils.	5
M1	Low woodland to forest of *Melaleuca rhaphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils.	5
M2	Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateritia*, *Viminaria juncea*, *Acacia saligna* and *Hakea varia* over *Lepidosperma longitudinale* on clay-loam soils.	3, 4, 5

The condition of vegetation was rated according to the scale used for assessing Bush Forever sites (Table 5; Government of Western Australia, 2000).

Table 5: Vegetation condition rating scale

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent fires, aggressive weeds at high density, partial clearing, dieback and grazing.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

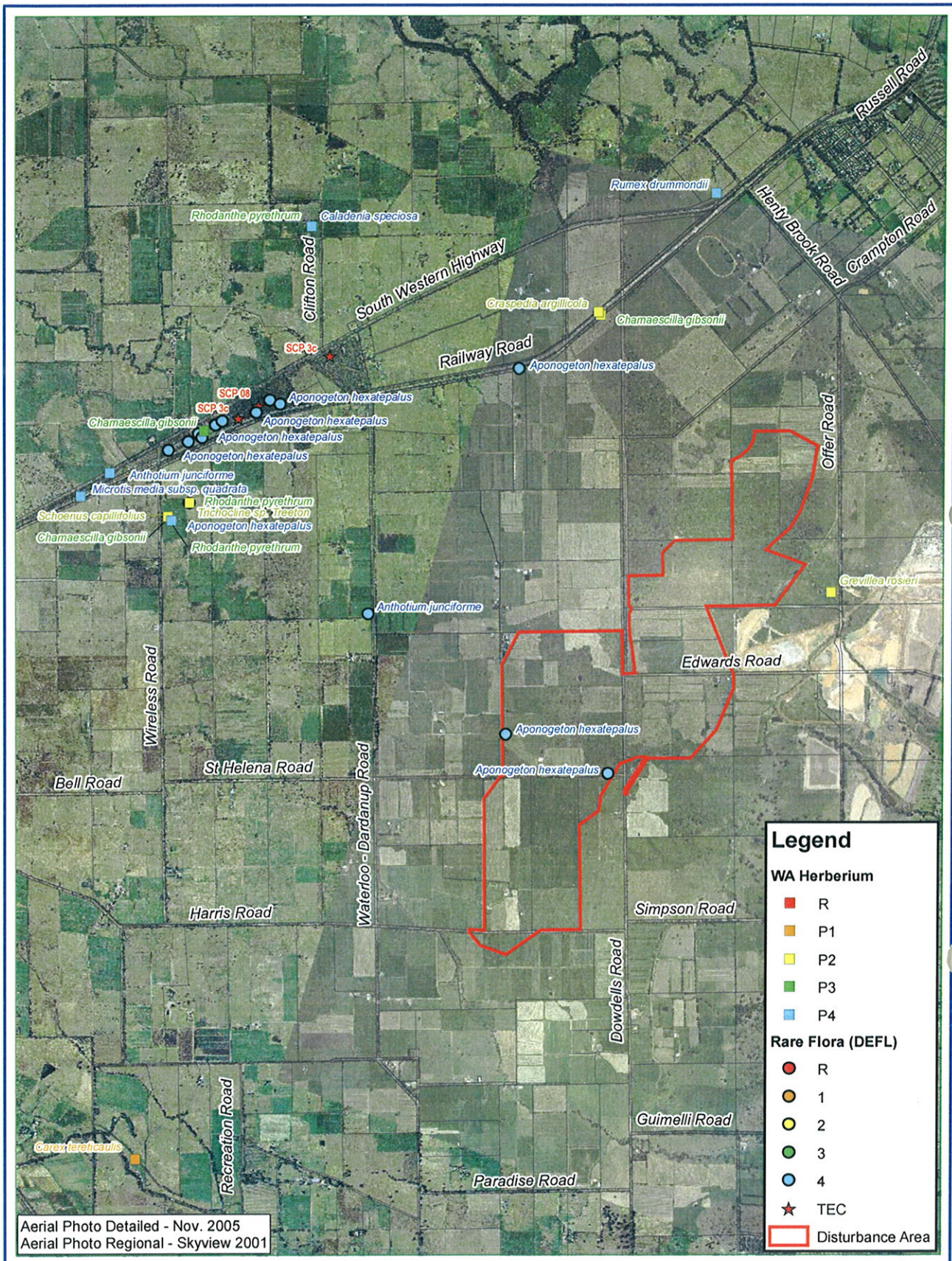
The majority of the site is either completely degraded (condition rating 6) or degraded (condition rating 5). Where native vegetation is present, it is generally native tree overstorey with weed/pasture species forming the understorey. There are several isolated remnants of good (condition rating 4) or very good (condition rating 3) vegetation which are mostly in or adjacent to road reserves (Figure 21).

Potential Threatened Ecological Communities (TECs)

Several TECs have previously been identified to the north west of the disturbance area (Figure 12).

A comparison of the floristic community types present within the study area to nearby TEC types was conducted by Mattiske Consulting Pty Ltd (2006) to determine the presence of any TECs as defined by either the WA TEC Scientific Advisory Committee or listed under the *Environmental Protection and Biodiversity Conservation Act 1999*.

Within the study area was a localised patch of *Corymbia calophylla* community (C4) that has similar dominant species to TEC Community type SCP 3a, although has a very low overall floristic similarity of 0.09, using the Sorenson Similarity Index. TEC type SCP 3a is listed as critically endangered by the State and endangered under the *Environmental Protection and Biodiversity Conservation Act* (Mattiske Consulting Pty Ltd 2006). TEC SCP 3a is described as *Corymbia calophylla – Kingia australis* woodlands on heavy soils. Within the study area, community C4 was restricted to a 0.6 ha area on the Simpson Road Reserve (Figure 13). The vegetation condition was rated as "good" (Figure 21).



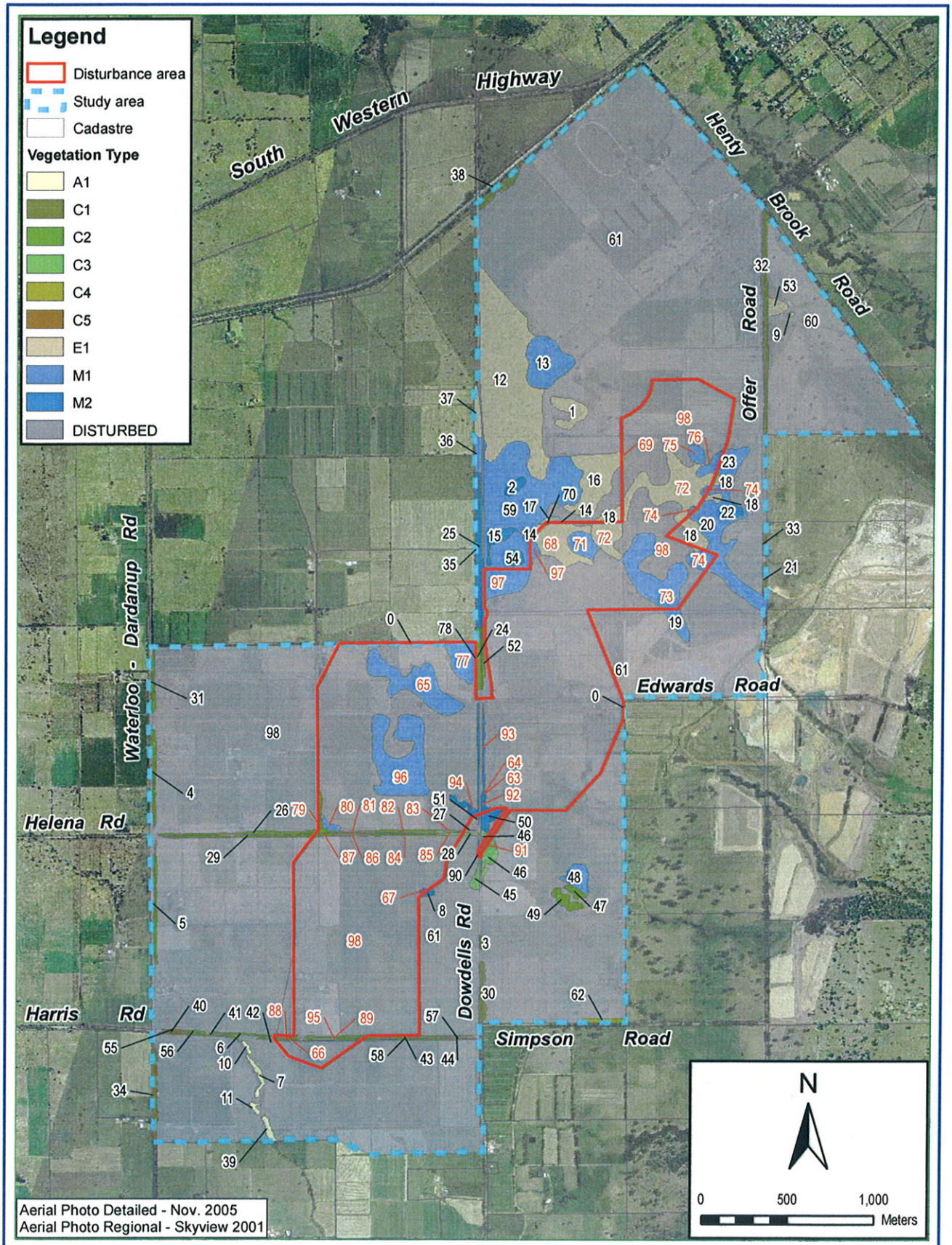
BUREKUP

PRIORITY FLORA and TEC's

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:40,000 (A4) DATE: 23 Nov. 2007 DWG No: 178375 ver.00

FIGURE: 12



BUREKUP

VEGETATION TYPE

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 176739 ver.01

FIGURE: 13

Figure 14: Community A1

Figure 15: Community C1

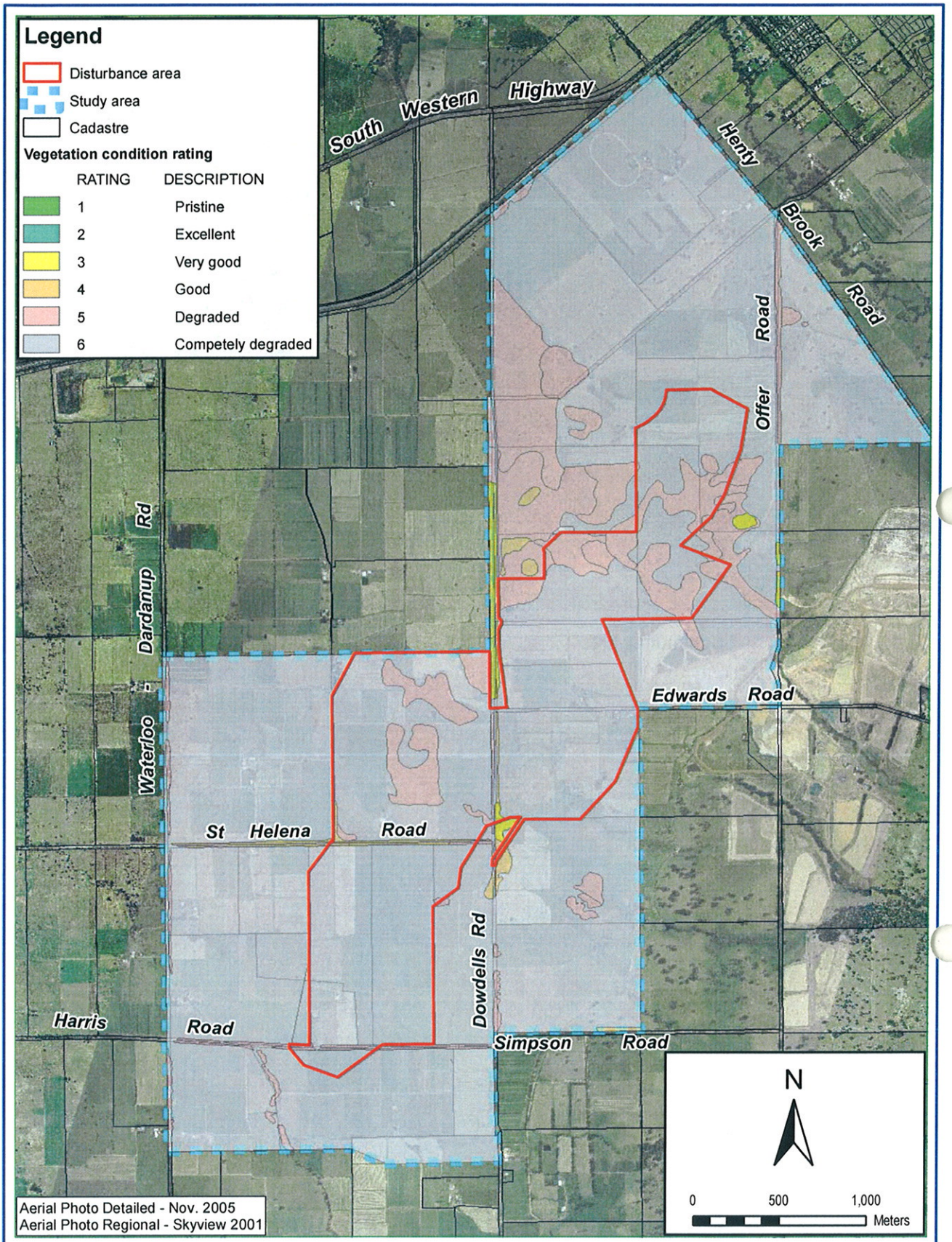
Figure 16: Community C2

Figure 17: Community C3

Figure 18: Community E1

Figure 19: Community M1

Figure 20: Community M2



BUREKUP

VEGETATION CONDITION

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 176624 ver.02

FIGURE: 21

Groundwater Dependent Ecosystem classification

The impact that groundwater drawdown has on ecosystems is related to the level of dependence that the ecosystem has on groundwater, the level of drawdown, the rate of drawdown and the duration of drawdown.

The first step in determining the potential for impact from groundwater drawdown is determining whether the ecosystem is dependent on groundwater, that is, whether it is a groundwater dependent ecosystem (GDE) and if so, the degree of that dependence.

Investigations have been conducted at Burekup to provide a site specific assessment of the potential for ecosystems to be groundwater dependent (SWC, 2007c). This assessment includes information on soil properties at the site and the water use requirements of the vegetation to determine groundwater dependence of each ecosystem present (SWC, 2007c).

The water retention characteristics of the soil strongly influence the dependence of vegetation on groundwater. Water retention data and soil distribution mapping from a soil survey conducted at Burekup (SWC, 2007a; Figure 6) were used to determine the average plant available water content (PAWC) for the entire soil profile for each of four SMUs present (Table 6). All SMUs within the Project have a relatively high PAWC of 8.4 – 9.1%. The PAWC is strongly influenced by the Guildford Formation, which represents the majority of the soil profile in each SMU.

Table 6: Plant available water content for the four SMUs in the Burekup mine area

Soil Management Unit (SMU)	PAWC (m3/m3)
SMU1: Uniform Brown Grey Heavy Clay	0.084
SMU2: Gradational Pale Grey Sand – Yellow Sandy Loam	0.087
SMU3: Pale Grey – Brown Sandy Duplex	0.085
SMU4: Yellow – Brown Mottled Duplex	0.091

Each vegetation community identified in the vegetation survey (Mattiske Consulting Pty Ltd, 2006) was broken down into specific sites (Figure 13) and assessed, considering the soil profile and the depth to groundwater underlying it, determined from the soil distribution model. The transpiration for all vegetation was assumed to be 600 mm/yr. Given the quality and density of the vegetation remaining in the vicinity of the Project, this transpiration rate is likely to overestimate the actual water use requirements of the vegetation in the area, and will result in an overestimation of the groundwater dependence of the vegetation.

By multiplying the PAWC of the soil beneath vegetation by the depth to groundwater beneath that vegetation, the amount of soil water available to that vegetation can be determined. By dividing that amount by the volume of water transpired by the vegetation, the percentage of the vegetation's water requirements which are available from the soil profile can be determined. Where the volume of water available in the soil profile exceeds the volume required by the vegetation, the vegetation is not dependent on groundwater for survival. Where the volume of water available in the soil profile is less than the volume required by the vegetation, the vegetation is dependent on groundwater. The level of dependence is determined by the percentage of the vegetation's water requirements that can be supplied from the soil profile. SWC (2007c) designates GDE classes as follows:

- Class 1: 80% dependence on groundwater

- Class 2: 50% dependence on groundwater
- Class 3: 20% dependence on groundwater
- Class 4: No dependence on groundwater

Using the SMU and depth to water information, and the PAWC for each SMU, a GDE classification was determined for each vegetation site identified at Burekup and the risks and possible impacts associated with each potential GDE were determined.

The majority of vegetation in the vicinity of the Project is not dependent on groundwater (non-phreatophytic). Rather, the vegetation is reliant on soil moisture. Isolated areas of lower depth to groundwater occur, where the vegetation has a degree of dependence on groundwater. Groundwater dependent vegetation is restricted to the central and eastern portions of the proposed mine site (SWC, 2007c).

Vegetation sites 3 and 30 (C1), 47 and 49 (C2), 27, 28, 45 and 46 (C3), 48 (M1) and 50 and 51 (M2) were considered to have some degree of groundwater dependency. Seven of these sites are rated as condition 5 (degraded), 4 are condition 4 (good) and 50 are condition 3 (very good).

The degree of impact likely for each vegetation site is dependent on the class of GDE (how dependent they are on groundwater) and the predicted drawdown beneath that vegetation. Vegetation with a GDE classification of class 1 is more susceptible to decreases in water level than a GDE of class 3, and the greater the decrease in water levels, the greater the potential for impact. For each GDE class, there is a threshold of groundwater drawdown, below which no impact is likely (Froend and Zencich, 2001; cited in SWC, 2007c). The threshold for class 1 GDEs is 0.75 metres; for class 2 GDEs is 1.25 metres; and for class 3 GDEs is 1.75 metres.

The maximum GDE rating applied at Burekup was class 3 (20% dependency).

5.9. Fauna

A terrestrial vertebrate fauna survey was undertaken in February 2006 by Ninox Wildlife Consulting (Ninox, 2006). The survey encompassed the same Study Area as the vegetation survey (Mattiske Consulting Pty Ltd, 2006) and included a comprehensive desktop review and a field assessment. The survey conducted satisfied the requirements of a level 1 survey under the EPA Guidance Statement No. 56 (EPA, 2004d). A level one survey aims to identify potential fauna habitats and is used to determine the need for more detailed surveys. Due to the poor condition of the vegetation remaining in this area, very narrow road verges and lack of linkages to surrounding vegetation areas, a level 2 survey is not warranted. An aquatic ecosystems survey was also conducted (WRM, 2006), which also collected vertebrate fauna data associated with wetland habitats.

The results of these surveys have been collated in Table 7.

Table 7: Summary of fauna groups recorded during site surveys

Fauna Group	Ninox Species Recorded	WRM Species Recorded	Total Species Recorded	Ninox Potential Species but not Recorded	Total Species
Native Avifauna	14	8	20	52	72

Introduced Avifauna	-	-	-	2	2
Native Mammals	-	-	-	12	12
Introduced Mammals	-	-	-	5	5
Amphibians	-	3	3	3	6
Reptiles	-	-	-	18	18
Native Fish		2	2	-	2
Introduced Fish	-	1	1	-	1
Total Native Species	14	13	25	85	110
Total Species	14	14	26	92	118

During the terrestrial fauna survey, a total of 14 bird species, no native mammal, amphibian or reptile species and no introduced species were recorded. None of the species recorded were of conservation significance. The aquatic biota survey recorded three species of fish (including one introduced species), three species of amphibian and eight waterbird species.

Up to 55 further bird species may occur (either as resident, nomadic, migratory or occasional visitors to the area). Due to the lack of representation of preferred habitats and the degraded condition of much of the survey area, not all of these 55 species are likely to occur regularly. It is unlikely that the road verges and areas of ungrazed vegetation in this area support a great diversity of resident birds (Ninox, 2006). Five of the bird species that could occur are of conservation significance (see section 5.9.1). Of the eight waterbird species recorded in the aquatic ecosystems survey, all are common within the Southwest of Western Australia.

12 species of mammal are expected to occur in the general area, including nine species of bat, however it is unlikely that the road verges and grazed areas of native vegetation within the survey area would support a diverse range of native mammals. Three of the mammal species which may occur are of conservation significance (see section 5.9.1).

Four frog species could potentially occur in the survey area. All are common and widespread, even through relatively disturbed country. One of these species, *Crinia insignifera*, was identified by call only in a Henty Brook site in the aquatic survey (WRM, 2006). The aquatic survey also identified *Crinia glaureti* by its call at several sites and recorded tadpoles later identified as *Litoria adelaidensis* from Henty Brook.

Based on other surveys in the region, up to 16 reptile species may occur in the survey area. Most will be present only in the remaining native vegetation particularly that within road verges in relatively good condition. Larger species may be observed in cleared areas. No introduced species were recorded during the survey, however two bird and five introduced mammal species could occur.

The number of species of vertebrate fauna recorded during the site assessment is typical of an area that is almost completely cleared and/or degraded with little native vegetation in relatively good condition. The high level of disturbance that currently exists indicates that there will be a very low number of species reliant on the remnant vegetation that remains.

There were no fauna habitats or ecological linkages considered to be of particular significance to vertebrate fauna in the Study Area (Ninox, 2006). While the road verge vegetation will allow for the movement of small birds, these roads verges do not form a link between any areas of ungrazed bushland.

5.9.1. Conservation significant species

Carnaby's Cockatoo (*Calyptorhynchus latirostris*), which is listed as Endangered under the *EPBC (1999) Act* and as a schedule 1 species under the *WC Act (1950)*, could occur within the Study Area. While there is a lack of suitable remnant vegetation that would encourage this species to nest in the Study Area, it is possible that Marri (*Corymbia calophylla*) trees will provide some food resources when fruits are present. However, no evidence of any individual tree having been used for feeding in the recent past was noted in the Study Area.

Baudin's Cockatoo (*Calyptorhynchus baudinii*) may also occur within the study area. This species is listed as Vulnerable under the *EPBC (1999) Act* and as a schedule 1 species under the *WC Act (1950)* and is known to breed in the deep Southwest, extending north to Lowden, south east of Burekup. Baudin's Cockatoos are endemic to the Southwest of Western Australia although generally believed to avoid the Swan Coastal Plain.

The Fork-tailed Swift (*Apus pacificus*) is listed on both the Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA). This species is an aerial vagrant that may pass over the site, but is unlikely to be dependent on the area.

The Rainbow Bee-eater (*Merops ornatus*) is listed on the JAMBA and could occur in spring and summer. The species is known to breed in the Southwest of Western Australia, burrowing into flat sandy ground or sand banks. It is therefore possible that this species may breed in the Study Area.

The Peregrine Falcon (*Falco peregrinus*), which is listed as Other Specially Protected Fauna (Schedule 4) on the *WC Act (1950)* could also occur in the study area. This bird of prey is found across Australia preferring sites with tall perches for roosting and nesting.

The Cattle Egret (*Ardeola ibis*), recorded during the aquatic fauna survey is on both the Japan Australia Migratory Bird Agreement (JAMBA) and the China Australia Migratory Bird Agreement (CAMBA). This species is widespread throughout Australia (pers. Comm. Sue Creagh), has a large global population is evaluated as 'Least Concern' (IUCN Red List).

In addition to these birds, seven birds that are habitat specialists with a reduced distribution (RD) and nine birds that are wide-ranging with reduced populations (RP) could occur in the Study Area, although their presence may be restricted by the limited native vegetation present. Two RD species were observed during the survey – the Broad-tailed Thornbill and Yellow-rumped Thornbill.

There is one record of the Wambenger or Brush-tailed Phascogale (*Phascogale tapoatafa*) in the WA Museum collection from approximately 10 kilometres north-east of Burekup in 1997. This marsupial is listed as Schedule 1 under the *WC Act (1950)*. Given the lack of significant areas of native vegetation within the Study Area, there is only a slight possibility that this species may be present.

The Southern Brown Bandicoot or Quenda (*Isoodon obesulus fusciventer*) is listed as Priority 5 and can survive in areas of quite high disturbance as long as there remains dense vegetation for cover. However, predation by foxes, cats and domestic dogs in farming areas

can severely impact this species' survival on a local level. It is likely that Southern Brown Bandicoots will occur throughout the Study Area wherever some remnant vegetation provides adequate shelter.

The Western False Pipistrelle (*Falsistrellus mackenziei*) is listed as Priority 4. While this small bat has a widespread distribution in the Southwest, it appears to be locally common in Karri (*Eucalyptus diversicolor*) forests (Start and McKenzie 1998). These authors also suggest that this bat may be more common than it appears from recent captures. As this species of bat may roost in tree hollows and hollow logs it is possible that they occur within the remnant vegetation of the study area.

5.10. Noise

Background noise levels have been monitored at four locations surrounding the Burekup site for a period of two weeks in March 2007. Monitoring found that the background noise levels in the area are very low, typically 25 to 29 dB(A) (L90 of LA90) during both day time and night time hours (SVT, 2007). The variation in L90 noise level was similar at all sites, suggesting that there is a common source of background noise at all sites. There is some correlation between the recorded LA90 noise levels and prevailing wind strengths, suggesting that background noise is weather related (SVT, 2007). A mineral sands mine currently exists in the area and may contribute to background noise.

5.11. Radiation

All naturally occurring soils, rocks and minerals contain small amounts of the radioactive materials (radionuclides) thorium and uranium. The background gamma radiation level of the earth's surface is largely due to the presence of these elements. These radionuclides are not soluble and do not break free from the sand. The reason they are still present is due to their decay half life (time taken to lose their radioactivity) being millions of years.

Natural background levels within the Southwest region of WA are typically in the order of 0.2 micrograys per hour (µGy/h), however background levels vary from location to location based on the soils and minerals present in the area.

Mineral sands naturally contain more radionuclides than clays and 'yellow sands'. Throughout the mineral sands mining process, controls are in place to prevent any potential alteration to the background radiation of mining areas. Pre-mining and post-mining radiation surveys are conducted to confirm that the natural background radiation levels remain unchanged as a result of the mining process.

5.12. Social Environment

The estimated resident population in the Shire of Dardanup was estimated at 10,777 in 2006 with an annualised average growth rate over the 2001-2006 period of 3.8% (South West Development Commission, 2007). The unemployment rate for December Quarter 2006 was 2.8%.

The land use of the potential disturbance area is agriculture. There are several rural landholdings surrounding the disturbance area, with a diverse range of land use activities including horticulture, horse agistment, dairying and beef farming. This diversity is reflective of the Shire of Dardanup's diverse range of industries including beef, sheep and dairy farming, tree farming, earthmoving, viticulture, market growers, engineering and mining.

A mineral sands mine is located to the east of the proposed Burekup project.

5.12.1. Aboriginal Heritage

A search of the register of Aboriginal sites, maintained by the Department of Indigenous Affairs (DIA) indicated that there are no registered Aboriginal sites within the disturbance area. An archaeological survey (Anthropos Australis Pty Ltd, 2007) and an ethnographic survey (Ethnosciences, 2007) of the disturbance area have been undertaken in conjunction with the Gnaala Karla Booja registered native title claimants and the South West Aboriginal Land and Sea Council. One ethnographic site was identified during the survey. The site is a wetland located outside of the disturbance area (Figure 22). A small area at the southern end of the disturbance area has not been surveyed. This area covers a potential road diversion. Should the road diversion be required, the South West Aboriginal Land and Sea Council and local indigenous community will be consulted, and if required, the area will be surveyed prior to disturbance to ensure compliance with the *Aboriginal Heritage Act 1972*.

5.12.2. European Heritage

A search was conducted of the State Register of Heritage Places, the Commonwealth's Register of the National Estate and the National Trust's List of Classified Places, through the Heritage Council of Western Australia's Places database (August 2007).

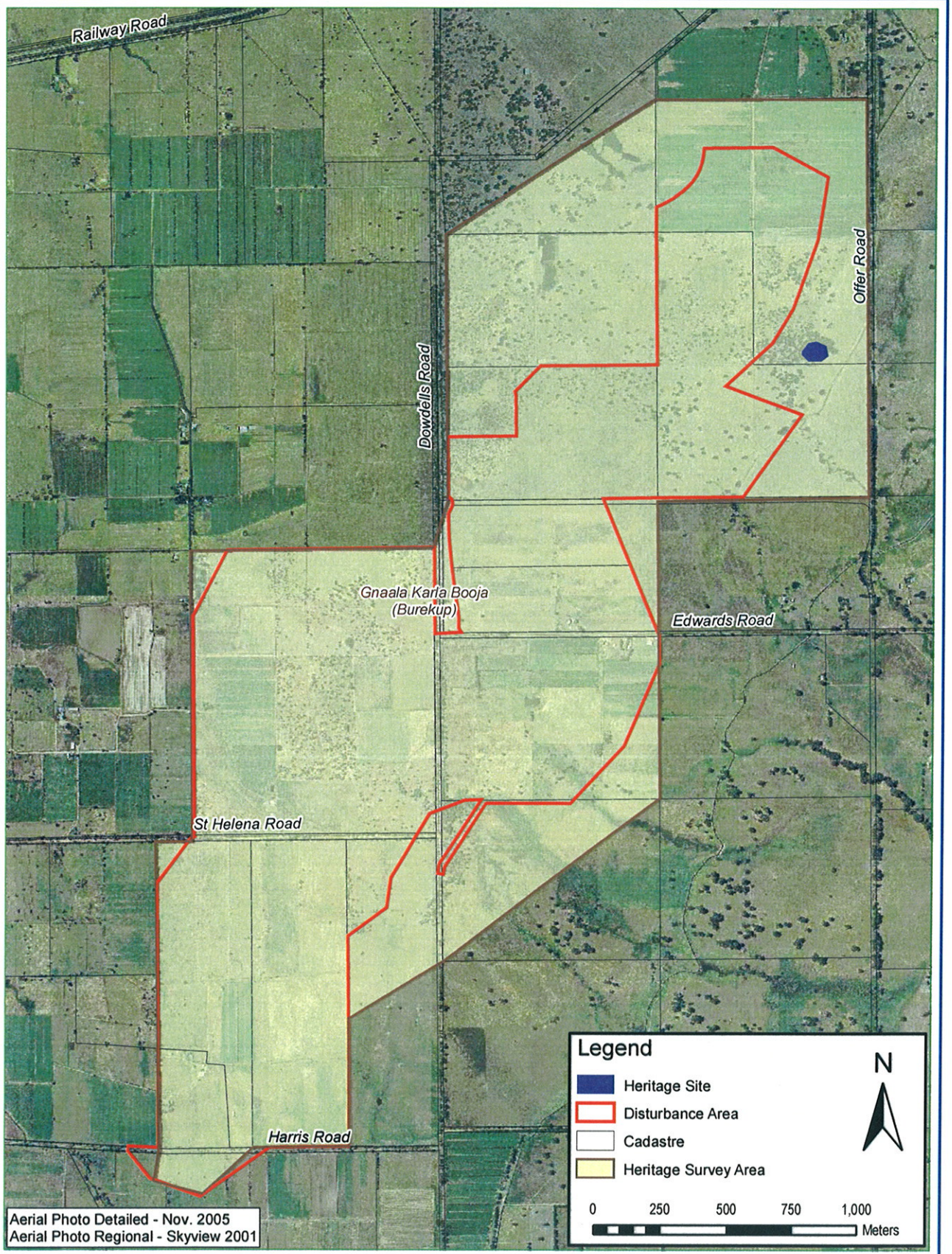
Place 03184, Ladysmith Plains townsite, is listed on the database as occurring at Offer and Edwards Road. Edwards Road runs east-west through the Project and Offer Road runs north-south, east of the Project. No evidence of a township has been sighted in the area. The Dardanup Shire dispute the existence of the township and it is not listed in the Municipal Inventory (September 2007). No other sites were identified as being located within the disturbance area.

5.12.3. Transport

HMC will be transported south to Capel by pocket road trains, requiring 48 movements (24 round trips) per day, 24 hours a day, 7 days per week. Traffic studies have been undertaken in consultation with the Shire of Dardanup to identify routes that minimise impacts on public safety, road use, amenity and maximise the use of gazetted heavy haulage routes. The route selected adds the least incremental trucks to the road. The proposed transport route from the mine is:

- Dowdells Line Road to South West Highway (Shire of Dardanup);
- South West Highway (Main Roads Western Australia (MRWA)) to Robertson Road (MRWA);
- Robertson Road to Bussell Highway (MRWA);
- Bussell Highway to Yeardy Road (Shire of Capel).

All roads proposed for use are existing heavy haulage routes.



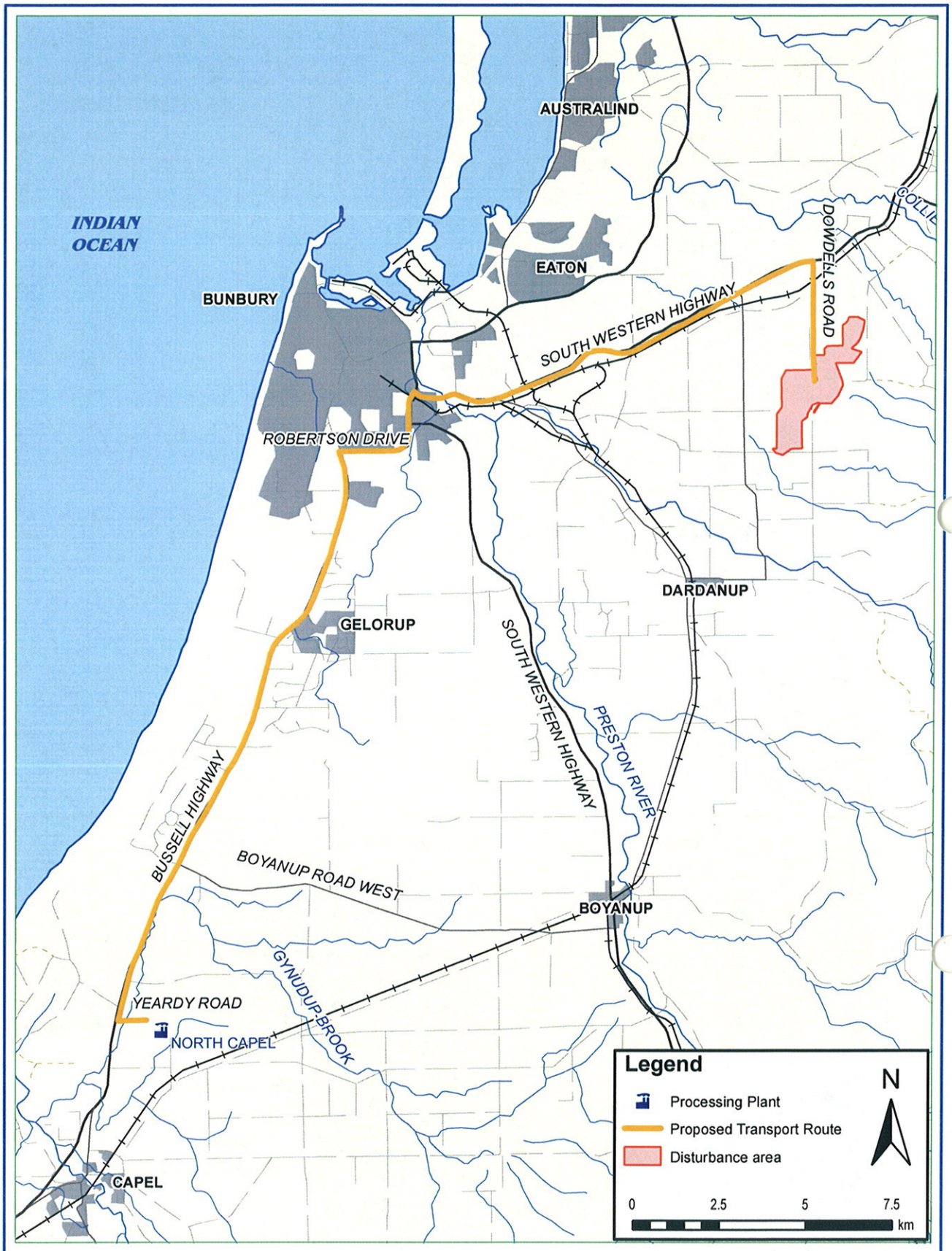
BUREKUP

ABORIGINAL HERITAGE SITES

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 14 Nov. 2007 DWG No: 178371 ver.00

FIGURE: 22



BUREKUP

PROPOSED TRANSPORT ROUTE

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:150,000 (A4) DATE: 23 Nov. 2007 DWG No: 178377 ver.00

FIGURE: 23

6. COMMUNITY AND STAKEHOLDER CONSULTATION PROGRAM

The following section outlines the community and stakeholder consultation program for the Project, which has been designed in accordance with the draft DoE Industry Guide to Community Involvement (DoE, 2003b). Effective community and stakeholder consultation is an essential component of the approval process.

Iluka has previously successfully conducted consultation programs for new projects and existing mine sites. Consultation with local stakeholders for the Burekup Project has commenced and solid working relationships have been formed.

To be 'valued by the community', Iluka takes a leading role in working with its neighbours, employees, indigenous groups and other stakeholders, to add value to the communities in the Company's operational and proposed project areas. Iluka has established partnerships by listening and acting on the following priorities:

- open and meaningful communication;
- participation in community activities;
- support for community initiatives;
- timely provision of planning and operational information;
- effective response to community concerns; and
- respect for indigenous culture and aspirations.

All Iluka's community interactions are based around the pillars of Communication, Transparency, Integrity and Collaboration.

Consultation with the Shire of Dardanup, DEC, EPA, DoW, landowners and neighbours has been undertaken in determining the scope of this document. Further consultation will occur throughout the approvals process.

A meeting is held with the Conservation Council each year to update them on upcoming projects and the Burekup project is included in this update. An invitation to meet to discuss the project has been extended to the South West Environment Centre. Further consultation with the community and interest groups will be undertaken during the preparation of the EIA.

6.1. Objectives

The aims of the program are to:

- inform stakeholders of the proposed operation;
- explore reaction and potential concerns regarding the proposal;
- gauge and/or gain public support for the proposal;
- implement and maintain a process through which residents, other interested groups and the Shire can communicate effectively with the company, and encourage the use of this process;
- ensure that all issues and disputes are dealt with in a timely manner and followed up effectively; and

- incorporate stakeholder input into the design and management of the proposed Project and report back on these outcomes.

6.2. Consultation Program

Initial consultation has commenced and a detailed consultation program will be developed and implemented. The consultation program will include neighbours, landowners, non-government organisations, government departments, and local shire. It is intended to keep local NGO's and local members of parliament informed of the Project as it develops. The consultation will be conducted in accordance with the DEC Community Involvement Framework (DEC, 2003). Additionally, Iluka will employ the principles of Enduring Value and current Iluka standards.

6.2.1. Identification of Stakeholders

Stakeholders in the project may include residents in the immediate surrounds of the project, business owners in the town, people within the local shire, special interest groups and decision making authorities. Stakeholders identified to date are listed in Table 8.

Other stakeholders will be identified through ongoing consultation and involvement in the local community.

Table 8: Potential Stakeholders

Stakeholder	
State Government	Department of Industry & Resources (DoIR)
	Department of Environment and Conservation (DEC)
	Hon Mick Murray MLA, local member for Collie-Wellington
	Dr Steve Thomas, Capel MLA, Shadow Minister for Environment
	Main Roads WA (MRWA)
	Environmental Protection Authority (EPA)
	South West Development Commission (SWDC)
Local Government	Shire of Dardanup
	Shire of Capel
Communities	Burekup community and nearby landholders
Aboriginal groups	Gnarla Kaarla Booja registered native title claimants
	South West Aboriginal Land and Sea Council
NGOs	Dardanup Land Conservation District Committee (LCDC)
	Conservation Council of Western Australia
	South West Environment Centre

6.2.2. Dissemination of Information & Identification of Issues

Consultation sessions, comprising one on one briefing sessions, presentations, site tours and general updates have been conducted with a range of government agencies, community

groups and individuals interested in the Burekup Project. Consultation with the specific stakeholders listed is outlined below.

Landowners in Project Area

The majority of properties which will be directly affected by the mining operations are owned by Iluka and leased to local farming businesses. Negotiations with the four remaining landowners are advanced. Landowner agreements will be in place prior to the commencement of mining.

Consultation with landowners commenced with an initial visit to outline the proposed Project, collate data on groundwater bores and surface water features and to arrange access to properties for flora and fauna studies.

Iluka has maintained ongoing communication with these landowners and they have been kept informed of and involved in environmental, geological and other feasibility works being conducted on their properties.

Neighbours within a 1 kilometre radius of the Burekup Project

The closest neighbours have had one on one briefings regarding the Project. Iluka undertook to keep neighbours informed of the development of the project. Most neighbours are familiar with mineral sands mining due to the presence of Doral's Dardanup Mineral Sands Mine. Neighbours were also contacted for the groundwater bore census and some neighbours were involved in flora and fauna surveys.

Iluka will provide neighbours with details regarding the hydrological modelling and potential noise impact.

State and Local Government

Iluka has briefed both the Dardanup and Capel Shires and the local Member of Parliament on the Burekup proposal. Prior to operations, Iluka will extend an offer to both Capel and Dardanup Shire, and the local MLA to attend a site tour.

Discussions, meetings and correspondence have taken place with the key decision making authorities for the Burekup project.

Local community

In addition to community updates, Iluka provides input to regional newspapers and local publications. Through its community sponsorship program Iluka has provided sponsorship for community events and developments such as the Dardanup Bull and Barrel Festival and has also supported Burekup Primary School. Recently Dardanup Primary School came to Iluka's Cloverdale mine for a tour.

Non Government Organisations

Iluka regularly conducts detailed briefings with the Conservation Council and affiliated organisations on an operational and project level. A briefing was provided on Iluka Projects, including Burekup, for the Conservation Council WA and Wildflower Society in September 2006

Iluka maintains regular consultation with the local LCDC groups like the Capel LCDC. Site tours and additional briefings will be provided to the Dardanup LCDC as the project progresses.

Iluka has extended an offer to brief the South West Environment Centre which has not been taken up. As with other key stakeholders, Iluka will offer additional briefings and site tours.

Gnaala Karla Booja registered native title claimants

Iluka conducted archaeological and ethnographic heritage surveys in conjunction with the claim group and the South West Aboriginal Land and Sea Council. Iluka regularly provides briefings on Iluka's sites and projects that fall within the claim group's boundaries, including the Burekup project.

Doral Pty Ltd

Doral operate the Dardanup Mineral Sands Project adjacent to Iluka's Burekup Project. Iluka has had several meetings and ongoing discussions with Doral at an environmental and managerial level.

Responses to Issues Raised

The above discussions with stakeholders have provided a substantial amount of information on the potential environmental issues of concern to the local and broader community. Table 9 summarises the issues raised and responses by Iluka during the consultation program.

Table 9: Issues identified in consultation program

Issues Raised	Response
Concern regarding noise from mining.	Iluka will minimise noise emissions from the operation and will develop agreements with neighbours and landowners if noise exceeds assigned limits.
Concern regarding groundwater drawdown impacting bores from mining.	The groundwater modelling predicts negligible impacts on surrounding bores. Iluka commit to providing make-up water supplies if any bores are found to be impacted by mining.
Concern regarding the potential for dust from the operation	Iluka will manage machinery operations and open areas to ensure that there are no offsite dust impacts.
Concern regarding the potential for neighbouring properties to be devalued by the mining operation.	Neighbours who demonstrate devaluation of their property due to Iluka's mining operations, may be entitled to compensation under the mining Act provided certain criteria are satisfied. Where neighbours fall within those criteria Iluka will meet its compensation obligations in accordance with the Mining Act.
Concern regarding the transport route, and the additional number of trucks it will add to the road.	Iluka has reviewed several transport routes and selected the route that adds the least incremental trucks to the roads. Transport will be managed to minimise any impacts on road users.
Concern that the project may not go ahead if environmental values and approvals processes were	Iluka has endeavoured to address all government approval requirements in a satisfactory manner to get the project approved.

Issues Raised	Response
too costly and timely.	

Ongoing Consultation

Iluka will continue to liaise closely with local authorities and the local community during the construction of the Project and will implement a consultation program which includes regular meetings with landowners in proximity to the mine, and community consultation as issues arise.

The consultation program following the release of this environmental review will involve:

- Ongoing liaison with the DEC, DoW, DoIR and community representative groups;
- Tours of existing Iluka operations for close neighbours and site tours for local NGOs;
- Discussions with the Shire of Dardanup regarding traffic management;
- Meetings with the general Burekup and Dardanup communities;
- Meetings with councillors and staff of local authorities;
- Providing information on the Project to the Iluka workforce;
- Providing the EPS and other Project information on the Iluka website; and
- Dissemination of information through community newspapers and Iluka's Community Updates.

7. ENVIRONMENTAL MANAGEMENT AT BUREKUP

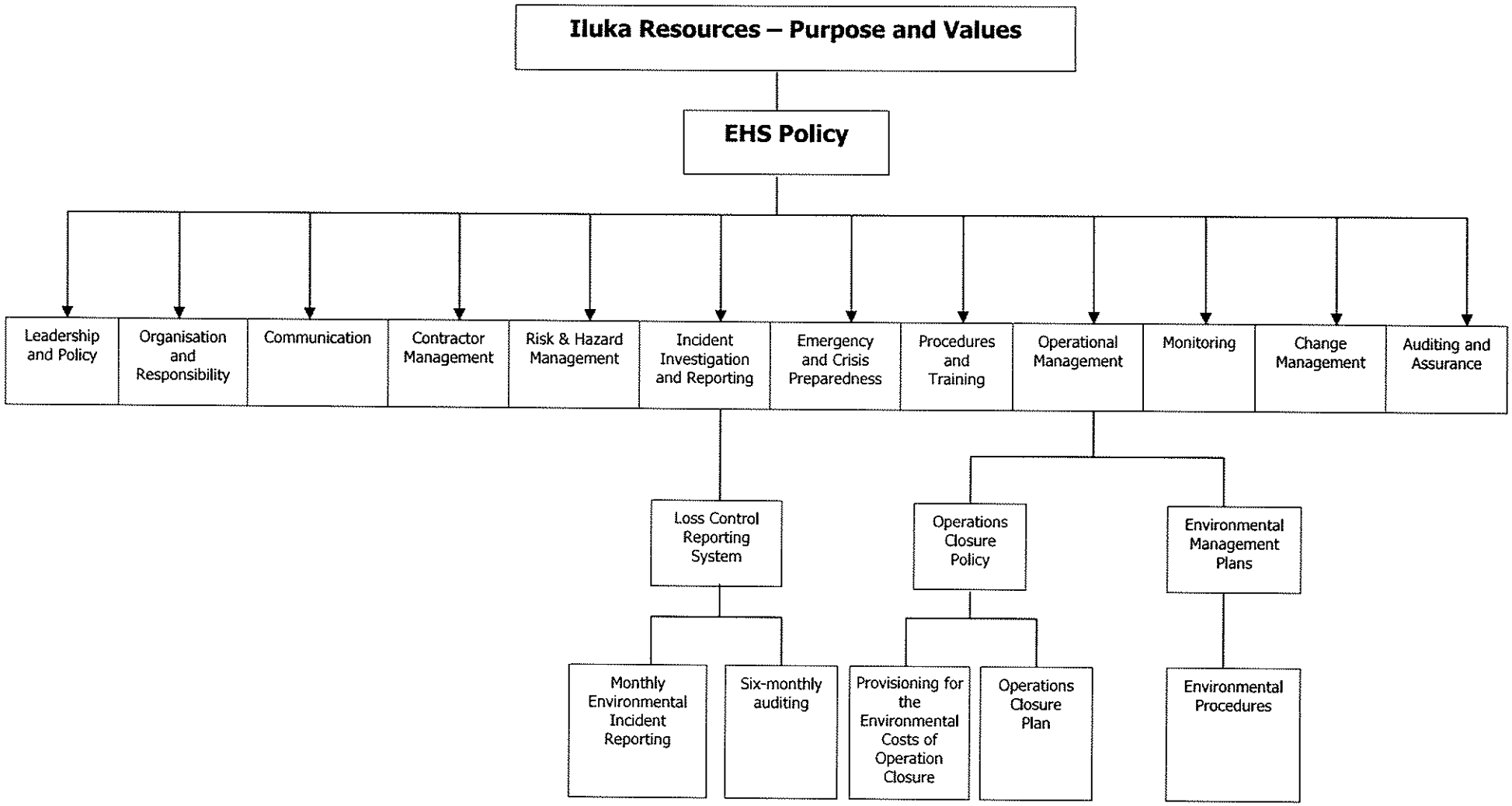
7.1. Iluka's Environmental Management System

Iluka has an environment, health and safety management system (EHSMS) in place to provide effective EHS management and continuous improvement in performance at all its operations. Iluka's EHSMS is designed to provide a framework for:

- developing and implementing a common approach to environmental, health and safety management across Iluka;
- integrating environment, health and safety management systems and processes into all business processes;
- effectively communicating company expectations to all employees, contractors and visitors;
- establishing clear environment, health and safety performance criteria against which all areas of the company can be monitored and audited;
- measuring environment, health and safety performance at all levels of the organisation;
- reporting environment, health and safety performance to stakeholders and interested parties; and
- ensuring continuous improvement in our environment, health and safety performance.

The EHSMS comprises:

- one corporate EHS policy;
- twelve EHSMS standards that describe the minimum requirement for all Iluka areas; and
- associated guidelines and tools to assist with the implementation and maintenance of the EHSMS (Figure 24).



ILUKA RESOURCES

EHS MANAGEMENT SYSTEM STRUCTURE

Figure 24

7.2. Iluka's EHS Policy

Iluka's EHS Policy is a statement of the company's commitment to environmental protection. It is a general condition of employment that Iluka employees at all levels behave in accordance with the policy. Iluka's EHS Policy commits Iluka to:

- not compromise on safety;
- comply with all legislative requirements;
- work closely with our customers and maintain a product stewardship approach to our products to enable their ongoing use;
- identify, assess and manage environmental, health and safety hazards, risks and impacts of our operations;
- maintain an EHS management system to apply uniform standards to all operations and personnel;
- promote continuous improvement practices;
- minimise workplace exposure to hazards, ecosystem disturbance or degradation;
- re-establish disturbed areas as sustainable ecosystems and community assets;
- strive to use resources more efficiently by reducing, reusing and recycling waste products;
- encourage and support our employees to make positive lifestyle changes;
- understand and work to meet the expectations of the community; and
- provide appropriate training to employees and contractors to ensure environmental, health and safety issues and responsibilities are clearly understood.

7.3. Sustainable Development

The EPA Position Statement Towards Sustainability (EPA, 2002c) discusses the concepts of sustainability and outlines that sustainable development requires the integration of ecological thinking into all social and economic planning and actions. The EPA objective for sustainability is to ensure, as far as practicable, that the proposal meets or is consistent with the sustainability principles in the National Strategy for Ecological Sustainable Development (Commonwealth of Australia, 1992). The National Strategy for Ecologically Sustainable Development outlines three objectives for the mining industry in addressing sustainable development.

These are:

- to ensure minesites are rehabilitated to sound environmental and safety standards, and to a level at least consistent with the condition of surrounding land;
- to provide appropriate community returns for using mineral resources and achieve better environmental protection and management in the mining sector; and
- to improve community consultation and information, improve performance in occupational health and safety and achieve social equity objectives.

Concepts raised for the resource industry in the above guidelines have been integrated into the planning of the Project and the sustainable development strategies outlined below. In producing mineral products and supporting sustainable development at Burekup, a number of sustainable principles are considered and applied. These are detailed in Table 10.

Table 10: Implementation of Sustainability

Iluka Sustainability Principles	Burekup Project Implementation
Integrate social and ecological considerations with economic evaluations of mine planning.	Mine planning has been conducted to include social and ecological considerations. This has resulted in the following outcomes: • majority of heavy vehicle activities restricted to between 6 am and 7 pm, 7 days a week; • placement of solar drying dams and roads away from high quality native vegetation.
Ensure that mining operations enhance existing biological diversity where possible.	Existing biological diversity will be enhanced through rehabilitation and restoration of disturbed native vegetation
Ensure that mining areas are rehabilitated to sound environmental and safety standards, and to a level at least consistent with the condition of the surrounding land that enables the agreed post mining land use.	The disturbance area will be rehabilitated to agricultural land and to vegetation similar to pre-mining vegetation.
Provide for effective involvement and prior informed consent of communities regarding all decisions and actions that affect them, and engage stakeholders and government in order to gain their views and take their interests into account.	A comprehensive community consultation program has been conducted during the feasibility studies. This is detailed in Section 6.
Provide support to communities through Iluka's Community Development Program.	Iluka provides a wide range of community support to the local communities. This is detailed in Section 6.
Ensure that current and future economic growth of WA and Australia will benefit from developments by Iluka and optimise economic return to local communities from mining.	Mining of the resource will provide economic benefit to Iluka, the State and local community. Local employment and services will be utilised where possible.
Efficiently manage resources and wastes.	Mining allows for the efficient management of the mineral sands resource. Wastes will be minimised and managed as outlined in Section 10.5.
Be accountable for all our actions by regularly reporting to the community, stakeholders and the government on performance.	An annual environmental report will be prepared and submitted to government detailing performance against Ministerial Conditions and licence commitments. This will be made available to the community. Company environmental performance and management is also reported in the Iluka Annual Report to shareholders.
Support sustainable development through commitment towards continual improvement in all aspects of environmental, health and safety programs.	The management plans and annual reporting process provide a regular review and improvement program.
Development and support of generic and site-specific research and development programs on technologies and techniques to improve the	Iluka conducts and supports a range of research programs across the organisation. These including continuous noise monitoring trials, rehabilitation

Iluka Sustainability Principles	Burekup Project Implementation
effectiveness and efficiency of environmental protection measures.	trials and process waste management research.

7.4. Iluka's Closure Plan Policy

In order to demonstrate its commitment to achieve environmentally and socially acceptable closure of all operations, Iluka has adopted an Operations Closure Policy that is supported by procedures for provisioning for the environmental costs of operation closure and the development of a closure plan. Iluka's closure procedures have been developed in accordance with the Australia and New Zealand Minerals and Energy Council (ANZMEC) Strategic Framework for Mine Closure (2000) which outlines a range of objectives and principles including stakeholder involvement, planning, financial provisioning, implementation, standards and relinquishment and the Minerals Council of Australia Mine Closure Policy (1999).

7.5. Environmental Management Plans

Appropriate management of key environmental issues for the Project is detailed in Environmental Management Plans (EMPs) for the Project (outlined in sections 9 and 10). These plans define objectives, responsibilities and performance standards, and reference management and monitoring procedures for each environmental issue. Management Plans will be updated over the life of the mining operation.

The following Environmental Management Plans have been developed and are submitted with this document:

- Water Management Plan (Appendix 1);
- Vegetation and Flora Management Plan (Appendix 2);
- Noise Management Plan (Appendix 3); and
- Preliminary Rehabilitation Management Plan (Appendix 4);

7.6. Environmental Reporting

Statutory annual reports are submitted to government departments detailing compliance with conditions of approval and environmental performance.

Environmental performance at Iluka sites is monitored through a system including monthly reporting of incidents and reported through to the board of directors. Monthly internal environmental reports are generated. The system of environmental incident reporting is maintained at all Iluka sites through the use of the Loss Control Reporting System. This system ensures timely notification of any incidents, internal investigation into causes and actions arising from environmental incidents or potential incidents to resolve them and reduce the risk of repetition.

8. IDENTIFICATION OF ENVIRONMENTAL FACTORS

Preliminary investigations and consultation with key stakeholders into the potential environmental impacts from the proposed Project indicated that the environmental factors outlined in the Table 11 are applicable to the Project.

Sections 7, 8 and 9 of this document outline the relevant potential impacts and potential management for each environmental factor.

Table 11: Environmental Factors

Biophysical	Pollution	Social
Vegetation and flora	Surface Water Quality	Aboriginal Heritage
Fauna	Dust	European Heritage
Landform and Soils	Noise	Transport
Acid Sulfate Soils (ASS)	Radiation	Visual Amenity
Surface Water Quantity	Light	
Groundwater Quantity	Non-process Waste	
	Process Waste	
	Greenhouse Gases	

Iluka considers that the key environmental impacts associated with this project are:

- Management of groundwater drawdown beneath groundwater dependent ecosystems (GDEs)
- Management of groundwater drawdown within PASS areas below the orebody;
- The potential impacts of noise on nearby residents; and
- Clearing of native vegetation within the area of disturbance.

9. BIOPHYSICAL ENVIRONMENT: IMPACTS & MANAGEMENT

9.1. Landform & Soil

9.1.1. Objective

To maintain the integrity, ecological functions and environmental values of the soil and landform.

9.1.2. Relevant Standards

As there are no regulatory standards for general soil and landforms, the standard is to be assessed against the objective. Iluka has a well established approach to delineating and managing soils that minimises the risks of adverse effects and maximises structure and quality of soils for re-establishment of either native vegetation or pasture.

9.1.3. Issue Definition

The landform and soil profile will be disturbed through mining activities, excavating, stockpiling and later returning soil materials. The methods by which each of these activities is done have the potential to alter local and regional hydrology by changing surface and subsurface water flows within the site and the potential to diminish agricultural productivity, by altering soil characteristics. Topsoils and subsoils have certain physical, chemical and biological properties that assist plant growth. The soils need to be handled in a manner that these properties are retained for rehabilitation. There is also the potential for wind and water erosion on exposed surfaces and stockpiles during mining and rehabilitation activities.

9.1.4. Assessment and Management

In order to effectively manage soils such that materials removed can be replaced and appropriate landforms and soil profiles can be re-established, an understanding of the pre-mining environment is necessary. Pre-mining soil and agricultural assessments have been conducted (SWC, 2007a and John Wise Consultancy, 2006).

Ten separate pre-mine agricultural assessments were performed by John Wise Consultancy on 30 October 2006 for lots affected by the proposed mine. These independent assessments of the pre-mining land capability and pasture production will subsequently be used to benchmark the post mining productivity of rehabilitated land. All lots occurred within the Pinjarra Plain land system. Although the land tended to be poorly drained and suffer from winter waterlogging, it was generally productive for fodder crops and summer grazing.

The soils assessment characterised the pre-mine soils within the Project. The physical and chemical properties of the soils were characterised and soils that may develop adverse properties during mining and rehabilitation identified. The soils on site were classified into soil management units (SMUs) which have been described in section 5.4. The properties of the soils present were assessed and management strategies were developed, aimed at:

- maintaining optimal soil properties during mining and rehabilitation
- appropriate handling of soils that exhibit adverse soil properties to ensure no contamination with other 'good' or optimal soils

- minimising environmental impacts that may occur through inappropriate handling and utilisation of soils that exhibit adverse properties.
- preventing the development of adverse properties in these soils during mining and rehabilitation.

Management actions to meet these aims are outlined below.

Topsoil

Two distinct topsoil materials were identified:

- loamy topsoil which occurs within SMU 1 and SMU 4; and
- sandy topsoil, which occurs within SMU 2 and SMU 3.

Loamy topsoil is structurally degraded sandy clay which rapidly breaks down to a fine clay following disturbance. This leads to a high potential for dust generation and the material must be handled appropriately. Loamy topsoil should be stockpiled separately from sandy topsoil.

To assist in restoring the pre-mine productivity, each topsoil type will be returned to its pre-mine landform position post mining.

Topsoil stockpiles will have a maximum height of 3 metres, in order to maintain the soil's biological activity and retention of nutrient sources.

Subsoil

Three distinct subsoil materials were identified:

- sandy subsoil, which occurs within SMU 3;
- loamy subsoil, which occurs within SMU 2; and
- clayey subsoil, which occurs within SMU 1 and SMU 4.

Sandy subsoils are not structurally sensitive and can be handled easily, with no restrictions, during mining and rehabilitation.

Loamy subsoil have optimal soil structural and water holding properties. They are structurally sensitive to disturbance and should not be handled when either too wet or too dry.

Clayey subsoil includes the yellow-brown mottled sandy clay and the brown clay. It has adverse properties of high clay content and salinity/sodicity. However, its high plant available moisture content and existing utilisation by plant roots suggest that it will be beneficial to rehabilitation if handled correctly. Therefore it will be removed and stockpiled separately from the underlying overburden material.

Overburden

Overburden is a blue grey sandy clay material which exhibits adverse properties (high clay, salinity and sodicity). Overburden will be removed and stockpiled separately, then returned and overlain by subsoil and topsoil.

Implementation of the above management practices and the Preliminary Rehabilitation Management Plan will ensure the objective to maintain the integrity, ecological functions and environmental values of the soil and landform is achieved.

Proponent Commitments

- Implement the Preliminary Rehabilitation Management Plan.
- Prepare a Final Rehabilitation Management Plan.
- Implement the Final Rehabilitation Management Plan

9.2. Groundwater

9.2.1. Objective

To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected; and to ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

9.2.2. Relevant Standards

The use of groundwater is controlled under the *Rights in Water and Irrigation (RIWI) Act 1914*, administered by the DoW. The Act requires the regulation of water systems in certain localities, limits water extraction rates and requires monitoring and reporting.

The Australian and New Zealand Water Quality Guidelines (ANZECC, 2000), while not a regulation, provides trigger levels for assessing water quality and developing appropriate water management strategies.

The WRC *Water Quality Protection Guidelines* are a set of guidelines designed to protect water resources.

9.2.3. Issue Definition

Dewatering of the superficial aquifer will be required to enable dry mining activities. The water will be preferentially utilised for a process water supply. The following potential impacts may arise from dewatering:

- reductions in available water for groundwater dependent ecosystems (GDEs) within and outside of the disturbance area (addressed in section 9.5);
- reduction of groundwater levels may indirectly cause the oxidation of potentially acid sulfate soils (addressed in section 9.3);
- the need to discharge water from site when process demands are insufficient to consume the entire dewatering volume (addressed in section 9.4); and
- loss of amenity for nearby residences utilising shallow groundwater resources for stock and irrigation purposes.

9.2.4. Assessment and Management

The groundwater assessment conducted by PB (2007) aimed to determine the potential changes in the groundwater system due to mining. A model was created to estimate the

volume of water that would be required to be extracted from the mine pit to allow dry mining to occur; and the potential drawdown effect on water levels surrounding the mine pit as a result of that extraction. This information was then utilised in conjunction with information derived from the landowner water census, soil studies, vegetation studies and wetland studies to determine the potential impact on nearby water users.

Initial models were run in steady-state mode in order to calibrate the modelled potentiometric surface against observed hydraulic head. Predictive models were run using an initial steady state stress period to achieve equilibrium, then 61 transient stress periods to simulate the transient effects of mining on hydraulic head. The model drain schedule was based on the proposed mining schedule (PB, 2007). It is recognised that the model is conservative due to the low rainfall recharge implemented and the fact that infiltration is not accounted for, and therefore likely to overestimate changes in hydraulic head.

Groundwater inflows into the active mining void are associated with the flow of groundwater from areas surrounding the mine blocks and from upward flow through the base of the pit floor. Inflow rates during the mining operations depend on the time of the year and the depth of mine block excavation.

Inflows over the life of the mine are expected to vary from 8.2 L/s to 56.8 L/s. Monthly aggregate abstraction volumes area expected to range from 21 ML (based on minimum inflow rates) to 56 ML (based on maximum inflow rates) (PB, 2007).

The model estimated annual inflows ranging between 600 ML and 1300 ML, with an average annual inflow of approximately 900 ML. Using average anticipated inflows, the model estimated a total of 1,600 ML of groundwater will flow into the mine pits over the mine's life.

A superficial groundwater abstraction licence will be applied for under the *RIWI Act*. Water removed from the mine blocks is expected to be used for processing and a minor amount will be reinfiltrated back into the aquifer through deposition of sand tailings into the mine void.

Lowering of hydraulic head is predicted to centre on the active mine blocks and recover rapidly after backfilling. Due to the low conductivity of the Guildford Formation, the drawdown gradient is predicted to be significantly steeper in the superficial aquifer than in the Leederville aquifer.

Within the Guildford Formation, it is predicted that a lowering of hydraulic head will be apparent almost immediately. The hydraulic head within the Guildford aquifer is predicted to decrease by up to 8 metres adjacent to the active mine area; and to 1 metres at a maximum distance of 980 metres from the mine pit, adjacent to the in-pit hopper.

Within the Leederville Formation, it is predicted that a lowering of hydraulic head will be first seen three months after mining commences. The hydraulic head within the Leederville aquifer is predicted to decrease by up to 3 metres at the centre of the mine; and to 1 metre at a maximum distance of 980 metres from the mine pit.

Within eight months after the cessation of mining, the hydraulic head in both formations is predicted to have recovered to within 1 metre of pre-mining levels across the site.

Potential impact to landowner water sources

A bore census has been conducted which noted 22 landowner bores within approximately 1 kilometres of the Burekup site. Information for these bores was limited with bore

construction and groundwater level data generally unavailable. The groundwater assessment assumes that they are all superficial bores. Of the 22 bores, seven are predicted to experience changes in hydraulic head of greater than 0.5 metres. One bore is expected to experience lowering of hydraulic head of greater than 1 metre (~1.3 metres). This bore is located approximately 450 metres from the mine pit. The impact on landowner water supplies will depend on the depth of the bore, the depth of water within the bore prior to mining and the pump setting within the bore.

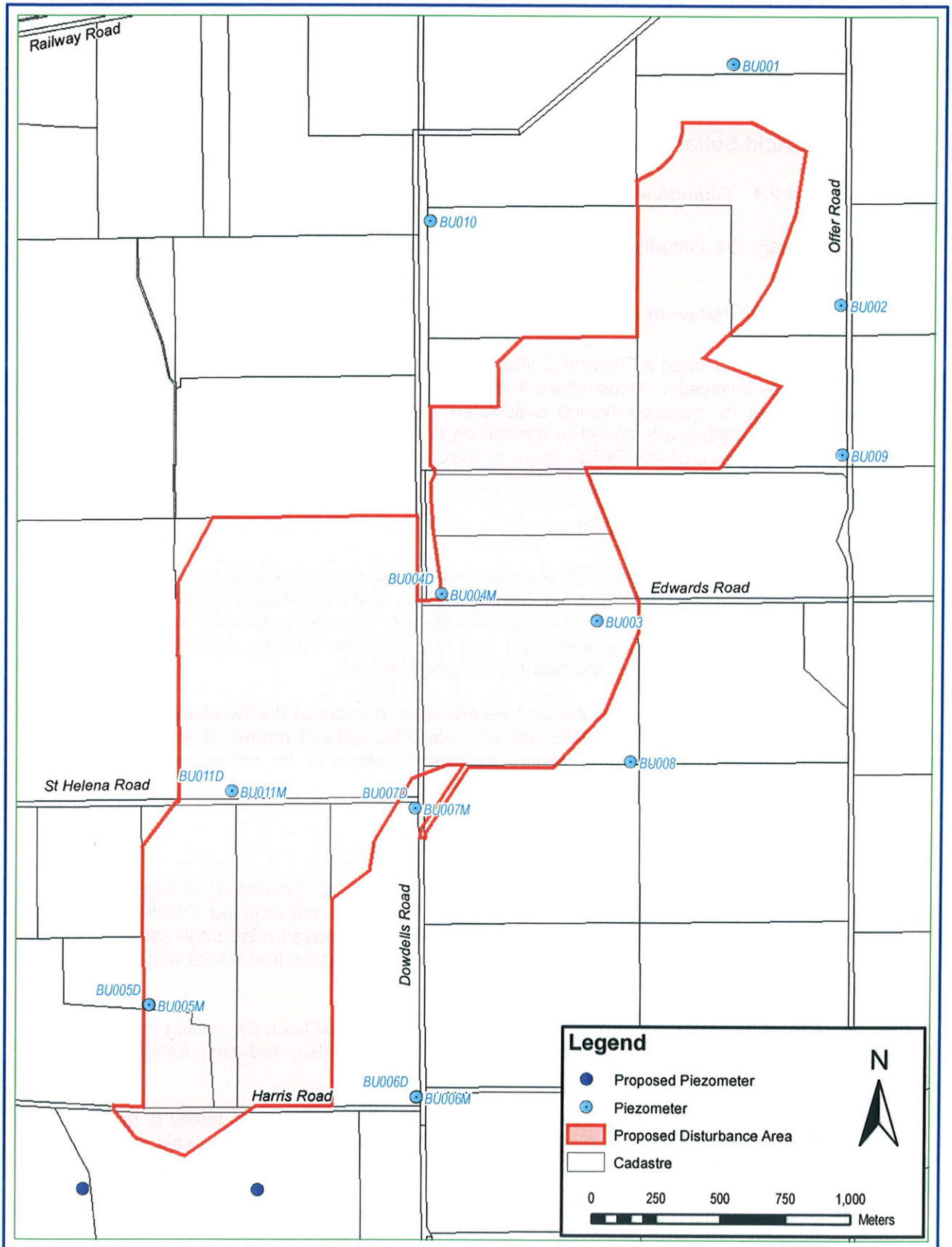
The site piezometer network will be monitored to compare predicted drawdown to actual and to determine any potential drawdown effects on water users. Two additional monitoring piezometers will be installed to the south of the site to monitor hydraulic head in the vicinity of neighbouring bores, as recommended by PB (2007).

Should any impacts to landowner bores be experienced by landowners and that impact be attributable to Iluka's mining activities, make up water supplies will be provided.

A Water Management Plan incorporating the above mitigation and management methods has been developed and is included as Appendix 1. Implementation of this management plan will ensure that the EPA objective to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected will be achieved.

Proponent Commitments

Implement the Water Management Plan.



BUREKUP

GROUNDWATER PIEZOMETERS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 23 Nov. 2007 DWG No: 178374 ver.00

FIGURE: 25

9.3. Acid Sulfate Soils

9.3.1. Objective

To maintain the integrity, ecological functions and environmental values of the soil and landform.

9.3.2. Relevant Standards

The DoE has released a General Guidance on Managing Acid Sulfate Soils (DoE, 2003b) to direct those involved in areas where ASS are present to sources of information, and provide a framework for decision-making associated with ground-disturbing activities in ASS risk areas. This guideline is aimed at minimising the risk to the environment resulting from the potential exposure of any PASS, to be achieved by implementing appropriate detection and management strategies.

9.3.3. Issue Definition

Mining within an area where ASS material exists presents the potential for acidic drainage to develop by exposing PASS to air and mobilising acids and heavy metals within AASS. Acidic drainage from the soils, if allowed to develop, can create adverse impacts on mine-site water, infrastructure, groundwater and surface water quality, downstream beneficial uses, environmental values and post-mining rehabilitation.

As detailed in section 5.6, no AASS soils are likely to occur at the Burekup site. No PASS exists within the mine pits. PASS has been identified within 1 metres of the pit floor, within the Leederville formation and mining excavation needs to be managed to ensure this material is not exposed by excavation or drawdown.

9.3.4. Assessment and Management

No PASS material will be directly disturbed by mining (i.e. excavated) at this site. While specific management of soil materials moved at this site is not required, PASS soils (pH_{FOX} soils < 2.66) occur within 1 metres of the base of the proposed mine pit in some areas, so groundwater dewatering must be carefully managed to ensure that PASS materials remain saturated.

To achieve this, in areas where PASS occurs close to the pit floor, the mining method will be modified to allow management of water levels to maintain reducing conditions, whilst maintaining safe working conditions

Minimal release of metals is expected to occur from the various soils tested in heavy metal leach trials if these soils hydrolysed or oxidised following disturbance. This is due to the quantities of metals leached during those trials and the initial low metals content of the soils (SWC, 2007b). Therefore, disturbance of these soils during mining and rehabilitation poses minimal risk to the environment and no specific management is required.

Groundwater surrounding the mine pit will be monitored using the piezometer network (

Figure 25) in accordance with the monitoring schedule in the Water Management Plan (Appendix 1). If monitoring suggests that mining has caused an adverse and unacceptable change in water quality, remediation measures will be developed in conjunction with the DEC.

By implementing the management practices outlined above, the objective to maintain the integrity, ecological functions and environmental values of the soil and landform will be achieved.

9.4. Surface Water

9.4.1. Objective

To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected.

To ensure that emissions do not adversely affect environmental values of the surface water and groundwater resources or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

9.4.2. Relevant Standards

Protection of the environmental values of surface waters on the Swan Coastal Plain are addressed in the *Environmental Protection (Swan Coastal Plan Lakes) Policy* (1992). Principles for the protection of wetlands is addressed in the *Preliminary Position Statement No. 4 Environmental Protection of Wetlands* (EPA, 2004).

The EPA *Draft Guidance No 26: Management of Surface Run-off from Industrial and Commercial Sites* (1999) addresses the assessment of surface water quality and management of surface water run-off to ensure that receiving water bodies are protected from contamination.

The *Australian and New Zealand Water Quality Guidelines* (2000), while not a regulation, provide trigger levels for assessing water quality and developing appropriate water management strategies.

The DoE/DoIR *Water Quality Protection Guidelines* are a set of guidelines designed to protect water resources.

A pollution prevention licence will be issued for the operation of the site under Part V of the *Environmental Protection Act 1986*. This is likely to include conditions on surface water, drainage and waste management.

9.4.3. Issue Definition

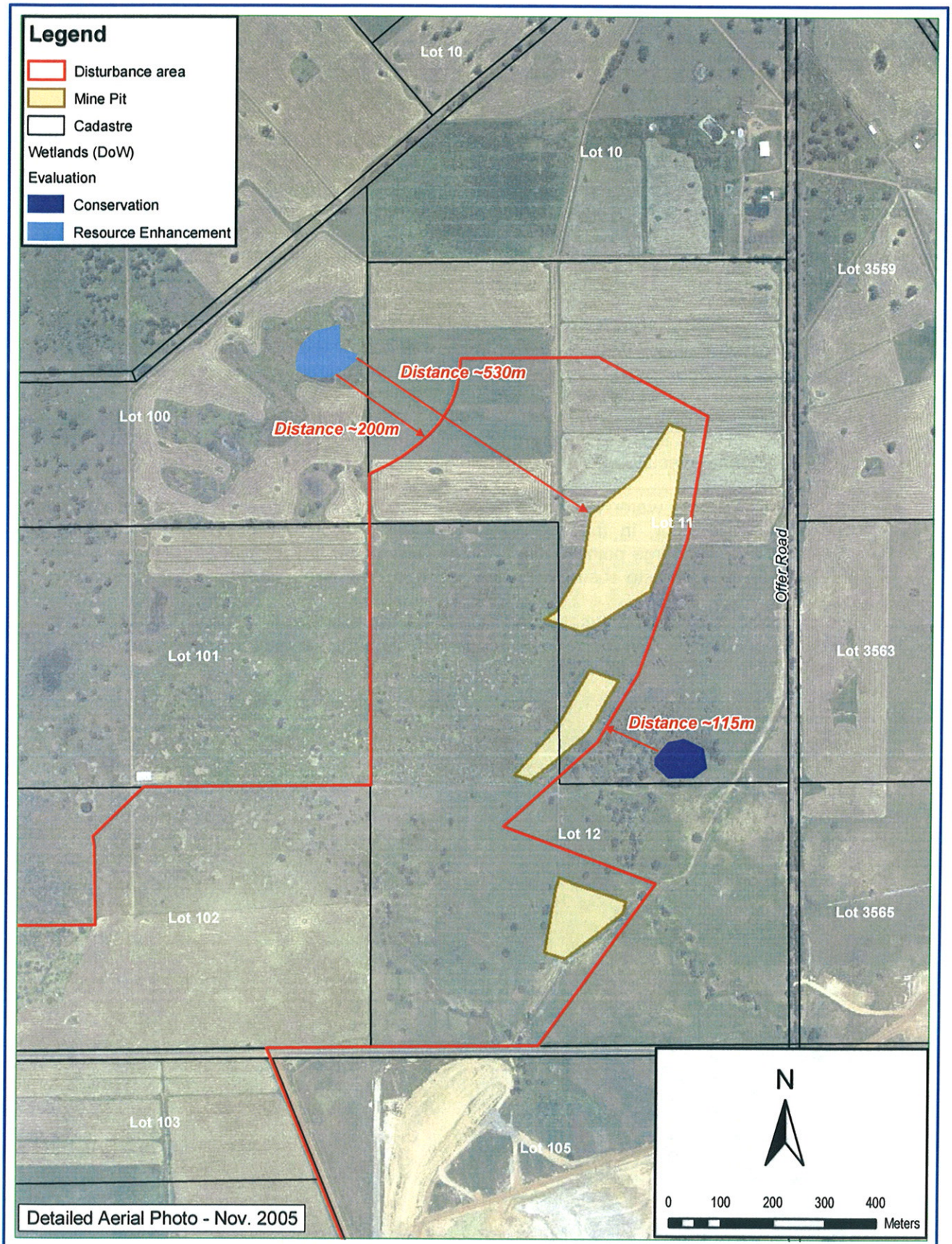
The drainage and irrigation channels passing through the Project will be excavated as part of the mining process. Dewatering of mine pits causes localised lowering of water levels. Mining therefore has the potential to alter flows in drains and water levels in wetlands.

Disturbance to soils and landforms has the potential to affect the turbidity and water quality of surface water and run-off. The mining operations have the potential to impact surface water quality through the inadvertent or accidental release of water of low quality from mining operations. Mine dewatering may produce water in excess of operational

requirements that will need to be discharged from site. It is also likely that water release will be required during construction when dewatering is taking place but processing water is not required.

9.4.4. Assessment and Management

The conservation category wetland is located approximately 100 metres from the pit void. The resource enhancement category wetland is located over 500 metres from the pit void and over 200 metres from any site disturbance (Figure 26).



BUREKUP

DISTANCE TO WETLANDS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:10,000 (A4) DATE: 23 Nov. 2007 DWG No: 170436 ver.03

FIGURE: 26

Henty Brook is located approximately 3 kilometres from the Project and is not expected to be influenced by mining activities as drawdown in the vicinity of the Brook is predicted to be negligible (PB, 2007). Groundwater modelling predicts the piezometric head to be lowered by up to 0.8 metres in the vicinity of the conservation category wetland and up to 0.4 metres in the vicinity of the resource enhancement wetland. Groundwater drawdown greater than 0.2 metres below the conservation category and resource enhancement category wetlands is predicted to last for less than 8 months.

Due to this predicted drawdown in the vicinity of the conservation category and resource enhancement category wetlands, further study was conducted on these locations as part of the GDE assessment (SWC, 2007c) see section 9.5 for information on this assessment.

Surface water control measures, such as bunding, will be implemented to prevent the loss of water from disturbed areas to the surrounds. Onsite contaminants will be contained to avoid potential adverse effects on surface water quality.

Where possible, site water will be retained on site and utilised for dust suppression and processing. However, in the event that site water discharge is required, this will be conducted at a discharge point licensed by the DEC under the prescribed premises licence, with monitoring in place to ensure that the water released meets discharge requirements.

It is proposed to discharge excess water into the Dowdells Line Road drain, adjacent to the concentrator location. Water will be pumped to a sump adjacent to the drain, prior to release. This drain is shown in Figure 27 and Figure 28.

Figure 27: Dowdells Line Road drain from approximate discharge point, looking south

Figure 28: Dowdells Line Road drain from approximate discharge point, looking north

A Water Management Plan that incorporates the above mitigation and management strategies has been developed and is included as Appendix 1. Implementation of the Management Plan will ensure that the EPA objective to maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected is achieved.

Proponent Commitments

Implement the Water Management Plan.

9.5. Vegetation and Flora

9.5.1. Objective

To maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities and of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

9.5.2. Relevant Standards

The EPA has developed a Position Statement for the *Environmental protection of native vegetation in Western Australia: Clearing of native vegetation, with particular reference to the agricultural area* (EPA, 2000a). In areas outside of the agricultural area designated in the position statement (including Burekup), the EPA will focus on the principles and the related objectives and actions of the National Strategy in its consideration of the

consequences of proposals for biological diversity. The following basic elements will be considered in assessments:

1. A comparison of development scenarios, or options, to evaluate protection of biodiversity at the species and ecosystem levels, and demonstration that all reasonable steps have been taken to avoid disturbing native vegetation.
2. No known species of plant or animal is caused to become extinct as a consequence of the development and the risks to threatened species are considered to be acceptable
3. No association or community of indigenous plants or animals ceases to exist as a result of the project
4. There would be an expectation that a proposal would demonstrate that the vegetation removal would not comprise any vegetation type by taking it below the "threshold level" of 30% of the pre-clearing extent of the vegetation type
5. Where a proposal would result in a reduction below the 30% level, the EPA would expect alternative mechanisms to be put forward to address the protection of biodiversity
6. there is comprehensive, adequate and secure representation of scarce or endangered habitats within the project area and/or in areas which are biologically comparable to the project area, protected in secure reserves
7. if the project area is large (and what is meant by large will vary depending on where in the State) the project area itself should include a comprehensive and adequate network of conservation areas and linking corridors whose integrity and biodiversity is secured and protected
8. the on-site and off-site impacts of the project are identified and the proponent demonstrates that these impacts can be managed.

In addition, the EPA has issued a guidance statement on the level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region No. 10 (EPA, 2003). The guidance aims at ensuring that developments are compatible with the intent of the recommendations for and/or conservation values of these areas. The Burekup project is situated within the System 6 region.

The *WC Act 1950* provides for the protection of all native flora, including declared rare and priority flora and the EPBC Act provides for the protection of threatened flora and communities.

In June 2004, the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* were released and came into effect. Under the regulations, areas subject to the formal environmental approvals process do not require a separate clearing permit. A separate clearing approval is therefore not required for this project.

9.5.3. Issue Definition

The majority of the Project comprises cleared agricultural land. Vegetation surveys by Mattiske Consulting Pty Ltd in December 2005 (Mattiske Consulting Pty Ltd, 2006) of the disturbance area and its surrounds (the Study Area) found that a large proportion of the site was disturbed and completely degraded.

Clearing

It is currently anticipated that the extent of mining will disturb a maximum of approximately 375 ha of land, of which a total of 0.5 ha was ranked as "very good" (condition 3) under the Bush Forever condition rating scale. Approximately 3.1 ha is native vegetation for which vegetation condition was assessed as being 'good' (Condition 4). Approximately 59 ha is 'degraded' vegetation (Condition 5). The remaining area of potential disturbance, 312 ha, is cleared agricultural land described as 'completely degraded' (Condition 6) (Figure 21). This area includes disturbance from mining, stockpiles, plant and infrastructure, process water ponds and solar drying dams.

Of the nine communities identified within the survey area, six occur within the proposed disturbance area. These communities and their occurrences within the study area and disturbance area are outlined in Table 12 and shown in Figure 21.

Table 12: Vegetation communities within the study area and the disturbance area

Community Code	Condition rating	Area within Study Area (ha)	Area within Disturbance Area (ha)
A1	5	1.6	0
C1	3	0.7	0
	4	0.5	0.5
	5	6.5	0
C2	3	1.4	0.1
	4	3.8	1.6
	5	7.6	1.3
C3	4	2.6	0.4
	5	0.4	0.2
C4	4	0.6	0
C5	5	1.6	0
E1	5	60.5	16.3
M1	5	82.7	39.4
M2	3	5.8	0.4
	4	3.4	0.6
	5	1.8	1.6
Disturbed	6	1121.4	312.0
TOTAL		1303.0	374.5

Significant vegetation and flora

The disturbance area is within the Guildford vegetation complex as defined by Heddle *et al*, (1980). 5.0% (4,662 ha) of the total pre-1750 extent of this vegetation complex remained in 1997/1998 (EPA, 2006). It is considered that within the disturbance area, the remaining vegetation is degraded and therefore unlikely to retain its values into the future. Generally, the overstorey is present, but the understorey is degraded due to grazing activities. It is therefore difficult to consider the degraded areas of vegetation remaining within the area to be of any local or regional significance (pers. comm. E. Mattiske, 2007).

No vegetation within the disturbance area is considered reasonably intact and of sufficient quality to be considered a TEC. The community that is considered a potential TEC (C4) is approximately 900 metres outside of the disturbance area.

No Declared Rare Flora (DRF) or Priority Flora (PF) species were located within the disturbance area, or the wider study area. Previous records of priority 4 species in the area are outside of the disturbance area and were not located during the 2005 survey.

Casuarina obesa within the study area occurs within vegetation community C3. There is 3 ha of this vegetation type within the area studied, and 0.6 ha of varying condition is within the disturbance area (see Table 12).

Eucalyptus wandoo within the study area occurs within vegetation communities C1 and E1. A total of 68.2 ha was recorded within the study area, of which 16.8 ha is within the disturbance area. Of this 16.8 ha, 0.5 ha has been rated as 'good' condition. The remainder is condition 5.

The *Corymbia haemotoxylon* present within the study area is restricted to vegetation community C5. All areas of community C5 are more than 500 metres outside of the disturbance area.

Groundwater Dependent Ecosystems

Groundwater drawdown caused by pit dewatering has the potential to impact GDEs. Groundwater drawdown impacts on vegetation have been assessed using maximum predicted groundwater drawdown contours and the GDE class. The response curves and risk assessment methodology from Froend, Bowen and Associates (2004) have been adapted to assess risk levels (Table 13). The potential impacts on vegetation associated with the assigned risk level are outlined in Table 14.

Table 13: Assignment of risk category to GDE class

GDE class	Groundwater drawdown threshold			
	< 0.75	> 0.75	> 1.25	> 1.75
1	Low	Moderate - High	High	High
2	Low	Low - Moderate	Moderate - High	Moderate - High
3	Low	Low	Low	Low - Moderate
4	None	None	None	None

Table 14: Expected Impact

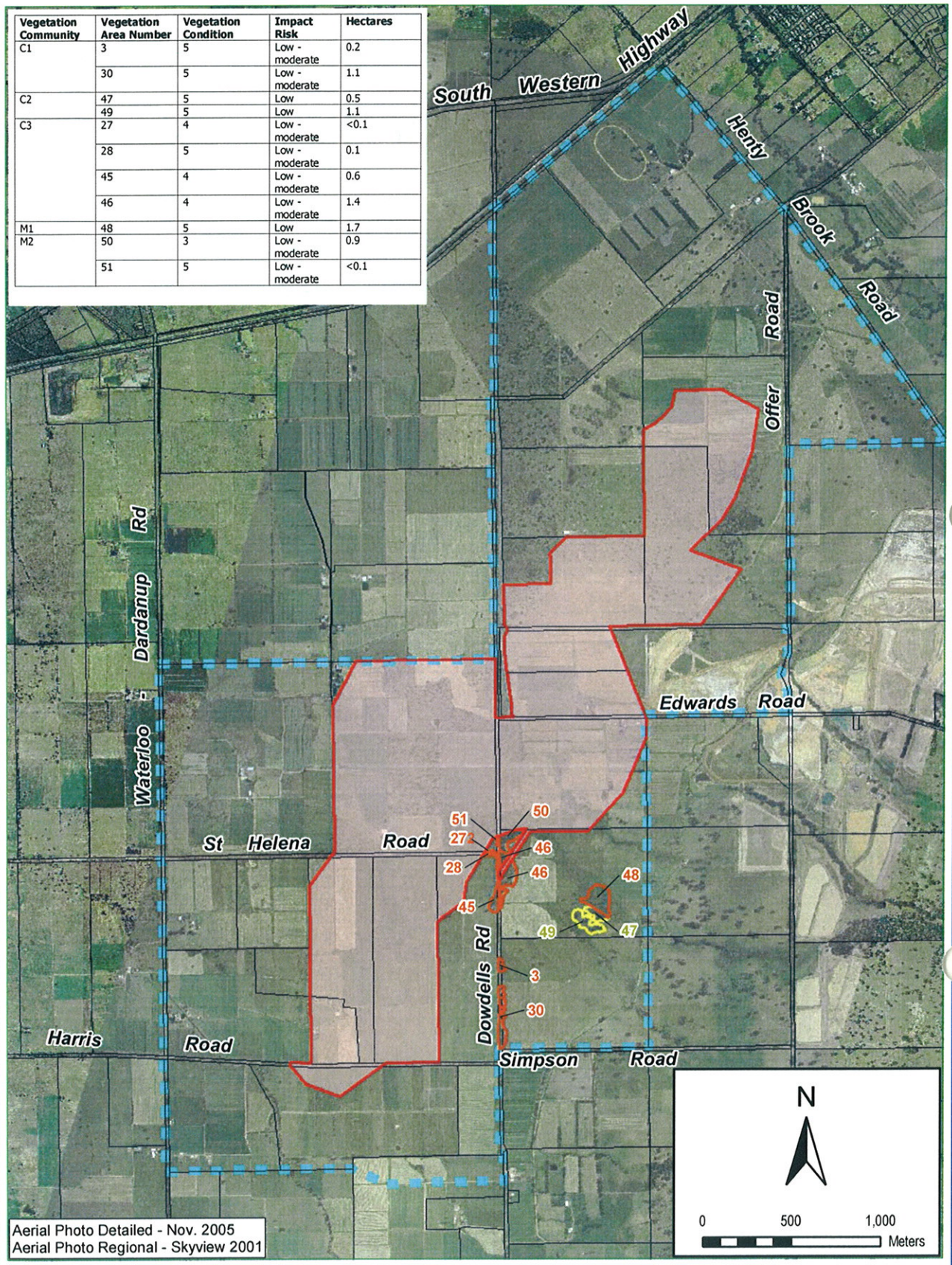
Risk	Expected Impact
Low	No significant change in distribution of species
Low – Moderate	Some evidence of changing distribution of species and encroachment of more drought tolerant species
Moderate – High	Measurable change in the demographics of some species with encroachment of more drought tolerant species
High	Overstorey or understorey decline and/or loss of species. Greater than 50% reduction in abundance of dominant species. For wetland vegetation possibly complete drying out of wetland basin or reduction in period of inundation

Table 15 shows the GDE vegetation areas and associated areas at risk of impact. Detail of expected drawdown impacts on the GDE vegetation areas is provided in the Vegetation and Flora Management Plan.

Table 15: Drawdown impacts on vegetation

Vegetation Community	Vegetation Area	Condition	Area in hectares			
			Low	Low – Mod	Mod - High	High
C1	3	5	-	0.2	-	-
	30	5	-	1.1	-	-
C2	47	5	0.5	-	-	-
	49	5	1.1	-	-	-
C3	27	4	-	< 0.1	-	-
	28	5	-	0.1	-	-
	45	4	-	0.6	-	-
	46	4	-	1.4	-	-
M1	48	5	1.7	-	-	-
M2	50	3	-	0.9	-	-
	51	5	-	< 0.1	-	-
Total			**3.3**	**4.5**	**-**	**-**

Vegetation Community	Vegetation Area Number	Vegetation Condition	Impact Risk	Hectares
C1	3	5	Low - moderate	0.2
	30	5	Low - moderate	1.1
C2	47	5	Low	0.5
	49	5	Low	1.1
C3	27	4	Low - moderate	<0.1
	28	5	Low - moderate	0.1
	45	4	Low - moderate	0.6
	46	4	Low - moderate	1.4
M1	48	5	Low	1.7
M2	50	3	Low - moderate	0.9
	51	5	Low - moderate	<0.1



Legend

- Disturbance area
- Study area

Ground Dependant Ecosystems

Impact Risk

- Low - Moderate
- Low

BUREKUP

GROUNDWATER DEPENDANT ECOSYSTEMS

RISK OF IMPACT

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 178373 ver.00

FIGURE: 29

Declared weed species

Declared weeds must be managed in accordance to their classification. For the four species recorded within the Burekup study area in 2005 (Mattiske Consulting Pty Ltd 2006), movement of the plant or its seeds is prohibited, including movement of contaminated machinery, livestock, fodder and other produce. Infestations of *Acacia dealbata* (Silver Wattle) must be destroyed and propagation prevented until all plants have been eradicated; and *Rubus fruticosus* (Blackberry) and *Gomphocarpus fruticosus* (Narrowleaf Cotton Bush) must be treated by destroying plants and/or preventing production of seeds and propagules. Herbicides to control Blackberry must be selected carefully as some stimulate propagation via suckering.

9.5.4. Assessment and Management

Vegetation Impacts

Considering both the direct (clearing) and indirect (groundwater drawdown), the maximum potential impact on vegetation communities as a result of the proposal is outlined in Table 16.

Table 16: Assessment of vegetation impacts

Vegetation community	Condition	Area surveyed (ha)	Clearing (ha)	Groundwater drawdown (ha)*	Total impact area (ha)	% of area surveyed
A1	5	1.6	0	0	0	0
C1	3-5	7.7	0.5	1.3	1.8	23%
C2	3-5	12.8	3.0	0	3.0	23%
C3	4-5	3.0	0.6	2.2	2.8	93%
C4	4	0.6	0	0	0	0
C5	5	1.6	0	0	0	0
E1	5	1.6	0	0	0	0
M1	5	82.7	39.4	0	39.4	48%
M2	3-5	11.0	2.6	1.0	3.6	33%
TOTAL		181.5	62.4	4.5	66.9	

* Areas of > low – moderate risk as identified in Table 15.

Iluka commits to infill planting in vegetation adversely affected by groundwater drawdown.

The criterion '*Representation of Ecological Communities*' in Guidance Statement 10 (EPA, 2003) seeks to assess how the communities within the potential disturbance area relate to the regional scale. Table 13 demonstrates that all vegetation communities found within the area occur outside the disturbance area. Whilst the risk of impact from groundwater drawdown exists for a small number of GDEs occurring outside the disturbance area, the highest level of risk is low to moderate. It is therefore believed that the representation of ecological communities will be maintained through the proposed development.

As the disturbance area is predominantly 'completely degraded' (condition 6), there are no significant ecological linkages present, and all commuities are present within the immediate

surrounds of the disturbance area, the proposal will not impact on the ecological processes, nor the diversity within the site (as defined under Guidance Statement 10 (EPA, 2003).

Flora Impacts

No DRF or PF species are expected to be impacted by the proposal, therefore there will be no impact to the '*Rarity*' within the site or species of '*Scientific and Evolutionary Importance*' within the site. No specific management is required.

Weeds

Declared weed species will be controlled as required. Weed hygiene measures will be implemented where necessary to prevent the spread of introduced species, particularly declared weed species.

Summary

A Vegetation and Flora Management Plan has been prepared and appended to this EPS (Appendix 2). Iluka will implement avoidance, mitigation and management strategies as outlined in this management plan.

In addition, a Preliminary Rehabilitation Management Plan has been prepared and appended to this EPS. The Plan contains strategies to be used to effect successful rehabilitation of both native vegetation and pasture.

Suitable offsets for residual impacts of the project have been developed in accordance with EPA Position Statement No. 9 and are outlined further in section 12.

The implementation of the Vegetation and Flora Management Plan and Preliminary Rehabilitation and Closure Plan will ensure the EPA objective to maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels is achieved. In addition a net environmental benefit will be achieved through implementation of offsets.

Proponent Commitments

- Implement the Vegetation and Flora Management Plan.
- Implement the Preliminary Rehabilitation Management Plan.
- Implement the offsets.

9.6. Fauna

9.6.1. Objective

To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

9.6.2. Relevant Standards

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) provides protection for listed threatened fauna species and habitat listed as Threatened Ecological Communities.

The Commonwealth is a signatory to the Japan Australia Migratory Bird Agreement (JAMBA) and China Australia Migratory Bird Agreement (CAMBA). Birds listed under these agreements are listed as migratory species under the EPBC Act.

The *Wildlife Conservation Act 1950* (WA) provides for the protection of rare fauna and birds protected under an international agreement and other special fauna that are listed on specified schedules. Other species for which the status of abundance is unclear and there is some concern are listed as Priority Fauna by DEC.

The *Endangered Species Protection Act 1992* (Cth) provides for the protection and recovery of listed endangered or vulnerable species and ecological communities. Similar to the protection of flora species, this Act generally applies to the protection of species on land under Commonwealth jurisdiction or to activities subject to other Commonwealth legislation.

The EPA has issued a guidance statement on the level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region No. 10 (EPA, 2003). The guidance aims at ensuring that developments are compatible with the intent of the recommendations for and/or conservation values of these areas. The Burekup project is situated within the System 6 region.

9.6.3. Issue Definition

The Project has the potential to impact on fauna through the loss of habitat and habitat fragmentation from clearing and groundwater drawdown. Iluka proposes to clear up to 3.6 ha of condition 3 and 4 vegetation, and up to 59 ha of condition 5 vegetation, over a total disturbance area of 375 ha. Groundwater drawdown caused by pit dewatering has the potential to impact on wetlands and vegetation, therefore indirectly impacting on the fauna utilising these areas for breeding, feeding, shelter or movement. Groundwater drawdown impacts on vegetation are discussed further in section 9.2.

Due to the patchy nature and variable condition of vegetation within the disturbance area and the surrounding area included in vegetation and fauna surveys, no fauna habitats of significance were identified (Ninox, 2006).

9.6.4. Assessment and Management

The Project includes the clearing of 3.6 ha of good or very good and up to 59 ha or degraded (parkland cleared) vegetation as outlined in section 9.5. The fauna survey concluded that the number of species of vertebrate fauna recorded was typical of an area that is almost completely cleared and/or degraded with little native vegetation in relatively good condition (Ninox, 2006). It is considered that the high level of disturbance that currently exists indicates that there will be very low numbers of species reliant on the vegetation remaining and the Project will have minimal impact on the vertebrate species known or predicted to occur (Ninox, 2006). The fauna species present are not specific to the proposed disturbance area and therefore, the '*Representation of Ecological Communities*', as defined under Guidance Statement 10 (EPA 2003a), will be retained through the proposed development.

The criteria under Guidance Statement 10 (EPA 2003) '*Rarity*', '*Species of Scientific or Evolutionary Importance*' and '*Diversity*' are addressed in Table 17 below, with an assessment on the potential impact on conservation significant species potentially occurring on site. This table shows that there will not be a significant impact on any rare or significant species or the diversity of fauna species.

Table 17 : Potential for impact on conservation significant species

Conservation Significant Species	Potential Impact
Carnaby's Cockatoo	It is unlikely that the proposed disturbance would impact significantly on populations of Carnaby's Cockatoo
Baudin's Cockatoo	It is unlikely that this species will be affected by development of the Project
Fork-tailed Swift	This species is unlikely to be dependent on the area, therefore is unlikely to be affected by the proposal
Rainbow Bee-eater	It is unlikely that this species will be affected by the Project
Peregrine Falcon	Given the Australia-wide distribution of this species, the loss of a small section of habitat in the Burekup area will have no impact on this bird
Cattle Egret	This species is widespread throughout Australia and has a large Global population. The species will not be impacted by the proposal
Broad-tailed Thornbill	It is unlikely that this species will be affected by the Project
Yellow-rumped Thornbill	It is unlikely that this species will be affected by the Project
Brush-tailed Phascogale	Given the lack of significant areas of native vegetation, there is a low possibility of occurrence of this species. There is likely to be no impact on this species
Southern Brown Bandicoot	Loss of some road verge vegetation is unlikely to have any significant impact on this species
Western False Pipistrelle	It is possible that this species occurs, however there is unlikely to be any impact on this species
Dicranophoroides caudatus	Given the distribution of this species across Australia, it is probable that it is pancontinental, with limited records due to limited sampling effort
Filinia cf *passa*	This species has been recorded in all but one State of Australia. It is probable that it is a pancontinental species with limited records due to limited sampling effort
Indeterminate Diffludiid Rhizopod	This species is probably undescribed, given the low level of research on testate Rhizopoda in Australia. It is likely that it is more widely distributed but yet to be recorded elsewhere

No specific fauna management is required, however, the clearing of vegetation will be minimised where possible. Facilities related to mining such as solar drying dams and soil stockpiles have been located on cleared areas, avoiding native vegetation areas where possible.

There are no significant ecological linkages present within the disturbance area or the wider survey area. There will therefore be no impact on the ecological processes within the site.

The Project will not have a significant impact on the fauna species known or predicted to occur and therefore the EPA objective will be achieved.

10. POLLUTION MANAGEMENT

10.1. Dust

10.1.1. Objective

To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

10.1.2. Relevant Standards

There is no regulatory standard relating to dust emissions, however the DEC will regulate dust emissions for the Project and are likely to set a licence limit for total suspended particulates (TSP) allowed at the site boundary when an environmental licence is issued for the site.

10.1.3. Issue Definition

The Project has the potential to generate dust from clearing of topsoil and overburden, through vehicle movement and lift-off from exposed surfaces during dry and windy conditions. Dust may also be generated through the course of conducting rehabilitation activities or on rehabilitated areas prior to the establishment of vegetation. Dust generated from the disturbance area has the potential to impact on nearby residences.

Dust emissions are significantly influenced by soil moisture conditions and prevailing winds.

10.1.4. Assessment and Management

Dust suppressant techniques employed on existing Iluka operations will be implemented as appropriate to minimise the generation of dust. Dust control measures may include:

- Minimising clearing and open area;
- Not disturbing topsoil until required;
- Regular watering and grading of roads;
- Using biodegradable chemical suppressants;
- Stabilising bunds and stockpiles from wind erosion;
- Growing temporary crops to bind soil and lift wind from surface; and
- Re-establishment of pasture as soon as possible after mining has been completed.

Dust monitoring will be conducted during operations in accordance with DEC licence requirements. Regular communications will be held with adjacent landowners and a complaints management system, including investigation, action and feedback, will be implemented as at existing Iluka sites. With the above mitigation techniques in place, there will be no adverse impacts from dust on environmental values or the health, welfare and amenity of people and land uses and the objective will be achieved.

10.2. Noise

10.2.1. Objective

To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

10.2.2. Relevant Standards

Noise limits are defined in the *Environmental Protection (Noise) Regulations (1997)*. The Environmental Protection Agency (EPA) addresses the assessment of environmental noise, including identification of potentially significant noise emissions and demonstration of compliance, in Draft Guidance No.8: Environmental Noise (EPA, 2007).

The Draft Guidance includes assessment of operational noise, involving determination of ambient noise, predicted noise levels, adjustments to predicted noise levels, comparison with noise criteria, noise reduction measures, consideration of other activities associated with the operation, blasting and monitoring and construction noise assessment, involving on-site operations, construction traffic, and blasting.

Under regulation 13 (Construction Sites), the noise levels outlined above do not apply to noise emitted from a construction site as a result of construction work carried out between 7am and 7pm on any day excepting Sundays and Public Holidays, provided that:

- construction work is carried out in accordance with control of environmental noise practices set out in section 6 of AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*; and
- the equipment used is the quietest reasonably available.

10.2.3. Issue Definition

The Project will generate noise from construction, mining and processing activities. The main source of noise will be earth-moving equipment, though fixed plant, including roadside pumps will also contribute.

Iluka plans to conduct the majority of earthmoving operations, between 6 am and 7 pm only, seven days a week. Supplying ore to and operating the in-pit hopper, screen plant and concentrator will be undertaken on a continual basis, 24 hours a day, seven days per week.. Noise impacts during the life of the project will depend on operational areas and atmospheric conditions.

10.2.4. Assessment and Management

The Project has been designed to minimise risk of offsite emissions in accordance with the Environmental Protection (Noise) Regulations, however there is potential for residences in the vicinity of the Project to receive noise levels in excess of the assigned noise levels as a result of project operations.

Noise modelling

Influencing factors are noise allowances for use when applying limits prescribed in the *Environmental Protection (Noise) Regulations*. The influencing factor for each residence is dependent on the distance of the residence from the mine's location. The relevant influencing factor for each residence has been calculated by SVT (2007) and is presented in Table 18.

Table 18: Noise limits at receiving locations (LA10)

Residence	Influencing factor in dB	Assigned Noise limits (LA10) in dB(A)		
		Day	Evening	Night
R1	0	45	40	35
R2	1	46	41	36
R3	0	45	40	35
R4	0	45	40	35
R5	0	45	40	35
R6	0	45	40	35
R7	0	45	40	35
R8	0	45	40	35
R9	0	45	40	35
R10	0	45	40	35
R11	0	45	40	35

Noise levels emitted from the mining equipment (fixed and mobile) have been calculated from existing mine sites. With the exception of the diesel dewatering pump, this data represents the noise levels from machinery that has not been modified to reduce noise, in order to predict the maximum potential impact. The diesel dewatering pump is assumed to be enclosed by a specially designed enclosure with an overall noise emission reduction of 25dB(A). The model was run with 10 metres noise bunds partially surrounding the concentrator, screen plant and contractor's area and five m noise bunds partially surrounding the solar drying dam decant sumps to reduce noise impacts.

Equipment noise data, together with local weather data, ground topographical data and receiver locations, was used to predict noise levels at nearby residences. Noise levels vary depending on the weather conditions and the operating locations of mobile equipment, therefore the model incorporated meteorological conditions likely to generate the highest noise levels (i.e. the worst case scenario), including temperature, humidity, inversion and wind speed.

The schedule for the proposed site was broken down into stages, defined by significant changes in mining activities. Four scenarios including one stage of construction (scenario one) and three stages of operations (scenarios two to four) were selected for modelling.

For each of the four scenarios selected, noise levels were modelled for day and night activities, under calm conditions and the eight cardinal wind directions, retaining all other worst case meteorological conditions. The model therefore predicts the expected worst case noise levels for each resident under each wind direction throughout the mine life.

An assessment of tonality was also applied during modelling. Assessment of tonality in received noise emissions depends on the existing level of ambient noise (i.e. whether tonality is likely to protrude above background noise) as well as the severity and duration of any tonality (SVT, 2007). A review of the equipment which dominates noise levels at each receiver was conducted to assess the likelihood of tonality being evident in received noise.

Where tonality is possible, a 5 dB penalty has been applied to predicted noise levels when assessing compliance.

Modelling results

In total, 11 of the nearest residences were included in the model (see

Figure 30). Two of these residences are landowners. The results of modelling are shown in Table 19.

Table 19: Worst case noise levels for residences (R) modelled

	Assigned noise limit Day/ night	Adjusted worst-case day and night noise levels in dB(A)								
		Scenario 1	Scenario 2		Scenario 3		Scenario 4		Max Exceedance	
		Day	Day	Night	Day	Night	Day	Night	Day	Night
R1	45/35	48.9	**54.7**	27.2	43.2	27.8	42.8	26.2	-	-
R2	46/36	47.4	**55.7**	29.7	**47.2**	29.7	43.9	29.7	**9.7**	-
R3	45/35	36.7	36.7	19.0	34.7	18.9	40.5	19.9	-	-
R4	45/35	33.1	32.4	16.7	33.4	16.4	**55.0**	18.2	-	-
R5	45/35	38.3	37.4	22.6	34.1	25.2	36.9	25.0	-	-
R6	45/35	45.2	43.3	25.4	**44.2**	29.5	39.4	29.5	-	-
R7	45/35	45.5	44.4	24.7	**44.3**	29.0	38.8	29.0	-	-
R8	45/35	48.8	46.8	25.0	44.5	**34.3**	38.3	**34.2**	1.8	-
R9	45/35	47.4	45.6	25.0	43.6	**34.3**	33.0	**34.3**	0.6	-
R10	45/35	49.5	46.4	28.5	42.5	**37.5**	40.5	**37.4**	**1.4**	**2.5**
R11	45/35	49.5	46.8	27.1	42.6	28.5	41.2	28.1	1.8	-

*predicted noise levels shown in bold represent those that have been adjusted to include a 5 dB tonality penalty. Shading represents an exceedance of the assigned noise level.

Table 20: Compliance assessments for worst case day and night operations modelled

Residence	Noise limit	Scenario 2		Scenario 3		Scenario 4	
		Complies	Non-compliant wind directions	Complies	Non-compliant wind directions	Complies	Non-compliant wind directions
Day							
R2	46	No	NE, E – W	No	E, SE, S	Yes	
R8	45	No	N, NE, E	Yes		Yes	
R9	45	No	N, NE, E	Yes		Yes	
R10	45	No	NE, E, SE	Yes		Yes	
R11	45	No	NE, E, SE	Yes		Yes	
Night							
R10	35	Yes		No	N, NE - SE	No	N, NE - SE

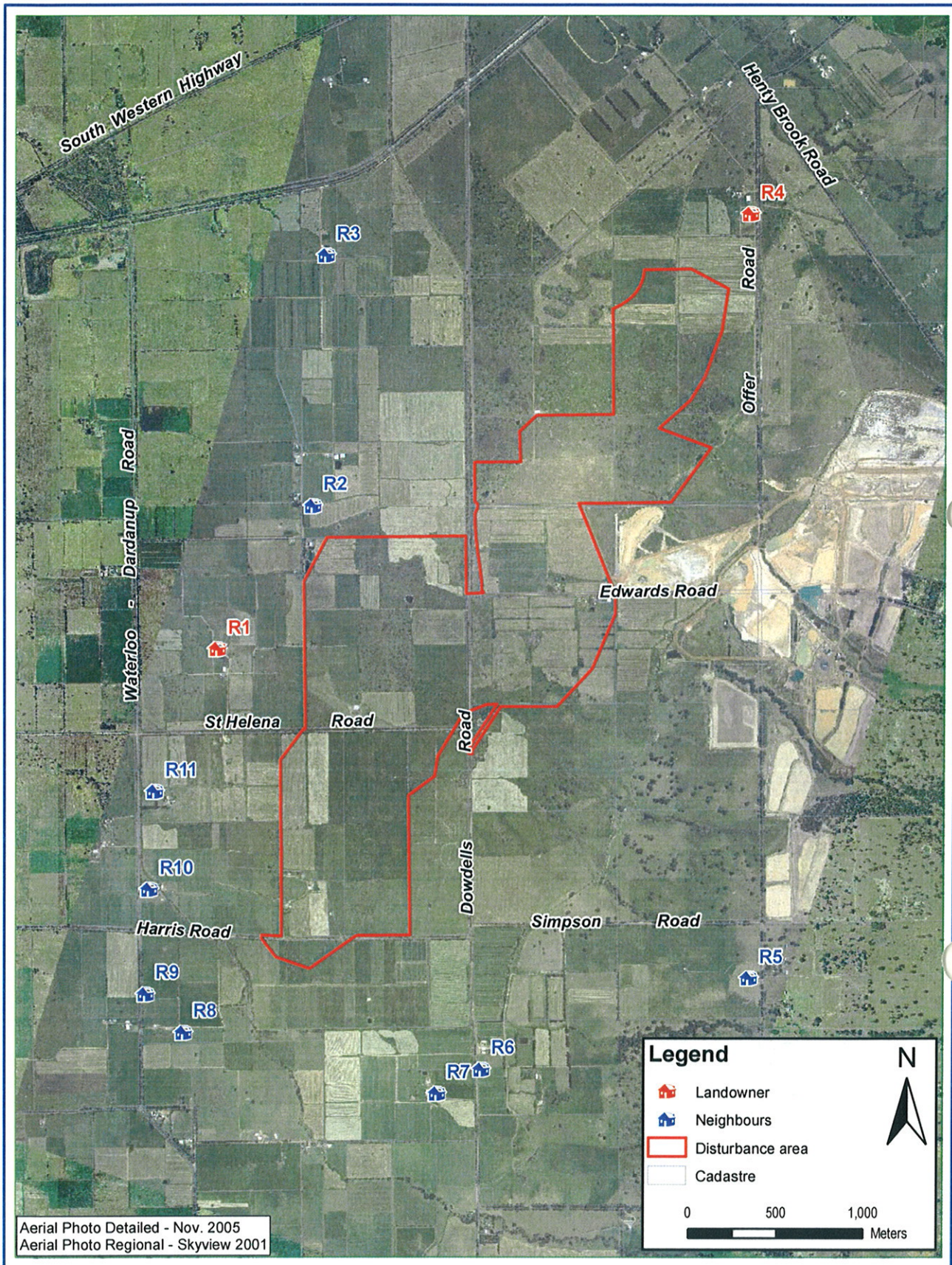
Two of the 11 residences are landowners and therefore not considered sensitive receivers (R1 and R4; Figure 30). During construction, residences R1, R2, R6, R7, R8, R9, R10 and R11 are all expected to receive noise levels over 45dB(A) under certain wind conditions, though this is allowed for under the regulations. The highest noise level predicted by modelling is 49.5, experienced by R10 and R11, when winds are from the east.

Residences R1, R2, R8, R9, R10 and R11 were predicted to receive exceedances during daytime operations under scenario 2. R2 is predicted to also receive exceedances during daytime operations under scenario 3. Including penalties for tonality and adjustments for influencing factors, R2 is predicted to receive noise levels up to 9.7 dB over the assigned day time noise levels. R8 and R9 are predicted to receive noise levels up to 1.8 dB and 0.6 dB over the day time noise limit respectively, when winds are from the north, north east and east. R10 and R11 are expected to receive noise levels up to 1.4 dB and 1.8 dB over the day time noise limit respectively, when winds are from the north east, east and south east

Only one residence, R10, was predicted to receive noise levels in excess of the assigned night time level, when a penalty for tonality is applied. The maximum exceedance is predicted to be 2.5 dB, when winds are from the north to south east.

The highest daytime noise level predicted by modelling was approximately 50.7 dB(A) under south-easterly and southerly winds at residence R2. The noise level increases to 55.7 dB(A) when the tonality penalty is applied. A maximum night time noise level of approximately 32.5 dB(A) is predicted in northerly to easterly winds at R10. The noise level increases to 37.5 dB(A) when the tonality penalty is applied.

Wind speed and direction were found to have a big impact on the noise levels at the closest residential locations. The key source of noise during daytime operations is mobile earthmoving equipment.



BUREKUP

RESIDENCES

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 178376 ver.00

FIGURE: 30

Management Actions

Several noise reduction measures were incorporated into site design prior to modelling. Earthen noise bunds five or ten metres high will be placed around key fixed plant to minimise noise emissions. A noise enclosure is also planned around the diesel dewatering pump and the in-pit hopper will be installed at the bottom of the mine pit, where it is screened by the pit walls.

Annoyance noises will be reduced by using directional broadband white noise alarms rather than standard reversing beepers and minimising the use of horns and alarms as alert systems.

Construction work will be conducted in accordance with Regulation 13 (Construction sites) of the Environmental Protection (Noise) Regulations 1997.

Heavy vehicle operation during construction will be restricted to between the hours of 6am and 7pm, 7 days per week. Heavy vehicle operation outside these hours will be limited to dust suppression where necessary. Low noise activities such as light vehicle movement, surveying, fencing and installation of fixed plant may be conducted outside the above hours provided that noise limits are met. The fixed plant will not be operating (with the exception of dewatering pumps, where necessary). Servicing of equipment may also be carried out at night.

During operations, the majority of heavy vehicle activities will be restricted to between the hours of 6 am and 7 pm, 7 days per week. Heavy vehicle operation outside of these hours will be limited to supplying ore to the in-pit hopper and dust suppression where necessary. Low noise activities such as light vehicle movement, surveying, fencing, installation of fixed plant and servicing of equipment may be conducted outside the above hours provided that noise limits are met. All fixed plant and pumps will be operating continuously 24 hours per day.

Agreements will be developed with five nearby residents (R2, R8, R9, R10 and R11) predicted to receive noise levels in exceedance of the regulations under worst case modelling. These agreements will be in place prior to the operational mining phase commencing.

Noise will be monitored during operations at designated monitoring locations. Any complaints received relating to noise will be investigated using the complaints management procedure. Nearby residents will be provided with contact details for the site manager and shift coordinator.

Monitoring of noise and regular consultation with landowners will ensure that any noise issues are identified and appropriately managed. A Noise Management Plan has been prepared and is included as Appendix 3 to this document. This plan includes details on monitoring and management.

Implementation of the noise management plan will ensure the objective to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal is achieved.

Proponent Commitments

- Implement the noise management plan.

10.3. Radiation

10.3.1. Objective

To ensure that radiological impacts to the public and the environment are kept as low as reasonably achievable and comply with acceptable standards.

10.3.2. Relevant Standards

The *Mines Safety and Inspection Regulations* (DoIR, 1995 - Section 16) requires that any mine involved with the mining of radioactive materials that may result in employees receiving radiation doses in excess of 0.001 Sv/year have a Radiation Management Plan. A guideline has been developed by DoIR that provides details on the development of a suitable detailed plan for the control and monitoring of radiation exposure and the management of radioactive wastes, as required under regulation 16.7 of the *Mines Safety and Inspection Regulations*.

The Radiation Management Plan must consider measures that can be taken to minimise exposure of employees and the general public to radiation by addressing use of appropriate facilities and equipment, monitoring programs, dosage assessments, reporting, training and inductions, and waste disposal.

Monazite is a naturally occurring mineral often found in association with the target minerals rutile, ilmenite and zircon. It is classified as a "Class 7" material and a Low Specific Activity (LSA) radioactive substance under the Dangerous Goods Regulations.

10.3.3. Issue Definition

The heavy mineral concentrate from the Project contains the mineral monazite. Monazite contains the naturally occurring radioactive elements thorium and uranium, which are associated with all heavy minerals mined by Iluka. The concentration of thorium and uranium in the heavy mineral concentrate produced is typically in the order of 800 ppm thorium and 100 ppm uranium, however varies, as it is significantly dependent on the percentage of the mineral monazite. The mineral monazite typically contains around 60,000 ppm thorium and 2,500 ppm uranium.

Monazite is the rare earth phosphate [Ce, La, Nd, Th (PO_4)]. Monazite content in mineral sand deposits is typically 0.1% and increases to approximately 1-2% in the heavy mineral concentrate.

10.3.4. Assessment and Management

A pre-mine background radiation survey will be conducted prior to ground-disturbing works commencing. The Project will follow the Iluka South West Radiation Management Plan which has been prepared in accordance with regulation 16.7 of the Mines Safety and Inspection Regulations, the Department of Consumer and Employment Protection (DOECP) guidelines and other associated relevant legislation. As detailed in this plan, measures taken to minimise exposure to radiation include the provision and use of appropriate facilities and equipment, monitoring programs, individual dose assessments, reporting, training and inductions and a waste management plan.

The handling, storage and transport of ore and HMC is able to be conducted safely in accordance with the approved Radiation Management Plan.

A post-mining radiation survey will be conducted to ensure levels are similar to pre-mining levels and thus demonstrate the negligible impact of radiation to the public and the environment as a result of the mining process.

Implementation of the Radiation Management Plan will ensure the objective to ensure that radiological impacts to the public and the environment are kept as low as reasonably achievable and comply with acceptable standards is achieved.

10.4. Light

10.4.1. Objective

To avoid or manage potential impacts from light overspill and comply with acceptable standards.

10.4.2. Relevant Standard

Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting outlines a range of management measures that can be utilised to assist in reducing the amount of diffusion and spill lighting created from proposals.

10.4.3. Issue Definition

Mining and processing operations will be undertaken on a 24-hour basis. Night lighting is required to ensure that the safety and security of operations is not compromised. However, lighting of night operations can also have negative external effects on nearby residents and traffic.

Potential impacts from illumination at night can arise from obtrusive light spill, by general luminance diffusion, reflection from existing surfaces or through atmospheric scattering. These effects may impact directly on neighbouring dwellings, can potentially create safety hazards on adjacent roads due to glare reducing the visibility of objects, interfere with night time navigation signalling and reduce the overall environmental night amenity.

10.4.4. Assessment and Management

The in-pit hopper and screen plant will be located below the natural surface level or behind constructed bunds so that nuisance light overspill is not likely to extend beyond the boundary of the disturbance area.

The majority of earthmoving activities will be conducted between 6 am to 7 pm. This will limit the requirement for, and impact of, light from the equipment on site.

Wherever possible, light towers will be erected so as to concentrate light on the work area, and minimise the potential for overspill.

The Australian Standard AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting, which outlines a range of management measures that can be utilised to assist in reducing the amount of diffusion and spill lighting created from proposals will be utilised in development of the Project.

Should any complaints be received regarding light spill, these will be followed up using Iluka's complaint management procedure.

Light spill will be managed to ensure the objective to avoid or manage potential impacts from light overspill and comply with acceptable standards is achieved.

10.5. Non-process Waste

10.5.1. Objective

To ensure that wastes are managed and disposed of in a manner that does not result in long-term impacts on groundwater, surface water and the natural environment.

10.5.2. Relevant Standards

The DEC has published guidelines including Guidelines for Acceptance of Solid Waste to Landfill (2002), Waste Management Bill 2000, Rural Landfill Management (2000), and the Western Australian Waste Reduction and Recycling Policy (1997) that address the appropriate disposal and management of solid wastes and recommendations for waste minimisation.

10.5.3. Issue Definition

Non-process waste produced by the operations will include green waste, hydrocarbon products, structural waste and domestic waste. No chemical waste will be generated in association with the mining operations.

10.5.4. Assessment and Management

Iluka encourages the use of landfill alternatives with the priorities for waste management being:

- Waste avoidance/reduction
- Reuse/recycle
- Waste treatment
- Waste disposal

Non-process waste produced by the operations will be managed as follows:

- Green Waste: Where viable, timber will be salvaged for use. Timber that can not be effectively utilised will be stacked and burnt.
- Hydrocarbon Products: All waste oils will be collected in a sump by the contractor and collected as part of Iluka's waste management system. All hydrocarbon-contaminated waste will be removed from site and disposed of according to waste regulations.
- Structural Waste: Some structural waste will be generated from maintenance activates. This waste will be recycled via a scrap metal merchant.
- Domestic Waste: Rubbish generated onsite such as food scraps, food wrappings and waste paper will be collected and disposed at the local Shire disposal site or an approved alternative.
- Domestic effluent: it is proposed that domestic effluent be collected and disposed of via either portable facilities managed by a contractor or via a council approved on-site septic system.

The above waste practices will be implemented at the site and will ensure that the objective to ensure that wastes are managed and disposed of in a manner that does not result in long-term impacts on groundwater, surface water and the natural environment is achieved.

10.6. Process Waste

10.6.1. Objective

To ensure waste streams from the process are returned to the mining void in a manner consistent with closure objectives and end uses of the site.

10.6.2. Relevant Standards

DOCEP has two guidelines for tailings management. *Guidelines on the Safe Design and Operating Standards for Tailings Storage* (DME, 1999) is designed to assist in the design, construction, management and decommissioning of tailings storage facilities so as to achieve efficient, cost effective, safe and environmentally acceptable outcomes. *Guidelines on the Development of an Operating Manual for Tailings Storage* (1998) is designed to ensure consistency of approach in developing Operating Manuals and an administrative framework which meets the requirements of regulations affecting the mining industry.

The Water and Rivers Commission *Water Quality Protection Guidelines No. 2 Tailings Facilities* (2000) provides guidance in managing the impact of tailings containment facilities on the quality of the region's water resources.

10.6.3. Issue Definition

Process waste produced by the operations will include overburden, oversize, clay fines and sand tailings. No chemical waste will be generated in association with the mining operations.

Clay tails are removed from the ore prior to the wet concentrator processing (Figure 5). The clay tails are pumped to a thickener and the underflow is pumped to shallow solar drying dams. The clay is allowed to dry prior to being returned to the mining pit.

Sand tails are produced by wet concentration and are pumped to the mining void. The sand and water streams separate easily allowing the sand to dry readily. The water component is returned to the process water dam with the dewatering water.

There is the potential to implement co-disposal of sand and clay tails directly from the concentrator to the mine void. If successful, this strategy will reduce solar drying dam requirements.

10.6.4. Assessment and Management

Process waste from the operation will be managed as follows:

- Overburden: Overburden (non-mineralised) waste will be returned to the mining void during mining and in the closure/rehabilitation phase of the project.
- Oversize: The wet concentration process requires all particles greater than approximately 2.4 mm to be removed from the ore. All material greater than 2.4 mm will be removed in the screening process, in a number of stages. The oversize will be

treated as overburden and returned to the mining void or utilised for dust suppression and road maintenance activities.

- Clay Fines: Clay fines will be removed from the ore prior to wet concentrator processing by hydro-cyclones. The clay fines will be pumped to thickeners and underflow from the thickeners will be pumped to shallow solar drying dams. Once dry, the clay fines will be excavated from the solar drying dams and placed into the mining void before being covered with overburden, subsoil and topsoil. Some of the clay fines may be incorporated into the subsoil to improve soil for rehabilitation purposes.
- Sand Tailings: Sand tailings will be produced in the mine site wet-concentrator and pumped to the mine void as slurry. The sand tailings will consist principally of silica sand. Rehabilitation of the sand tails will commence once the material is dry.

Management of process waste in accordance with the above practices will ensure that the objective of returning wastes to the mining void in a manner consistent with closure objectives and end uses of the site is achieved.

10.7. Greenhouse Gases

10.7.1. Objective

To minimise emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions.

10.7.2. Relevant Standards

State and Commonwealth legislation relevant to the emission of greenhouse gases from the Tutunup South project includes:

- the National Greenhouse Strategy for providing a framework for meeting international commitments;
- the Greenhouse Challenge as a voluntary program between government and industry to abate greenhouse emissions;
- the Energy Efficiency Opportunities Programme;
- the Western Australian Greenhouse Strategy; and
- EPA Guidance Statement No 12 – Minimising Greenhouse Gases.

10.7.3. Issue Definition

Implementation of the Project will result in the emission of carbon dioxide, directly or indirectly, as a result of the following activities:

- consumption of electricity;
- mobile mining plant and equipment, and transportation of HMC to Capel; and
- clearing of vegetation.

The Project is a continuation of Iluka operations in the South West. Iluka's greenhouse gas emissions will be not be significantly altered by this project as it will be replacing another Iluka operation.

Clearing of native vegetation will result in some emissions of greenhouse gases. Commercial harvesting of timber will occur in areas identified for clearing prior to mining. The residual vegetation will be pushed into heaps and burnt.

Projected greenhouse gas emissions due to consumption of diesel during mining and transport and consumption of electricity are expected to be approximately 31 000 tonnes per annum CO_2e based on other South west operations.

10.7.4. Assessment and Management

Iluka will ensure efficient use of all machinery. The company will also estimate emissions and consider options to minimise total greenhouse gas emissions from the project in line with the EPA Guidance Statement No. 12 - Guidance Statement for Minimising Greenhouse Gas Emissions (EPA 2002).

11. SOCIAL ENVIRONMENT: IMPACTS & MANAGEMENT

11.1. Aboriginal Heritage

11.1.1. Objective

To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

11.1.2. Relevant Standards

The *Aboriginal Heritage Act 1972* provides for the recording and protection of areas and artefacts used by the original inhabitants of Australia.

The EPA also consider aspects of Aboriginal heritage and have developed a Draft Guidance Statement for the Assessment of Aboriginal heritage with the objective of ensuring that the changes to the biological and physical environment resulting from the proposed development do not adversely affect matters of heritage significance to Aboriginal people. It is suggested in the Guidance Statement that the following actions be taken:

- consultation with the Aboriginal Affairs Department and desktop review of site records in accordance with the *Aboriginal Heritage Act 1972*;
- undertake an Aboriginal heritage survey including consultation with appropriate Aboriginal people and/or an archaeological survey;
- informing the relevant Aboriginal people of the proposal, including potential impacts;
- consultation with relevant Aboriginal people to highlight their concerns regarding the proposal; and
- demonstrating that these concerns have been adequately considered in impact management strategies.

11.1.3. Issue Definition

Baseline surveys identified an ethnographic site located outside of the disturbance area. The site will not be disturbed by mining activities (see Figure 22). No ethnographic or archaeological sites occur within the disturbance area.

11.1.4. Assessment and Management

Construction and operation of the mine site will comply with provisions of the *Aboriginal Heritage Act 1972*. If any sites are discovered during operations they will be investigated by an anthropologist or archaeologist and reported to the Department of Indigenous Affairs (DIA). In the event that any Aboriginal sites cannot be avoided, a section 18 application will be submitted.

By conducting surveys, liaising with local claimants and investigating any sites discovered during operations Iluka will ensure that the objective to ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation is achieved.

11.2. European Heritage

11.2.1. Objective

To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

11.2.2. Relevant Standards

The standard is to be assessed against the objective.

11.2.3. Issue Definition

No European heritage sites occur within the disturbance area.

11.2.4. Assessment and Management

No impacts are anticipated. If any heritage sites are identified during construction or operation, the Australian Heritage Commission, the Heritage Council of WA, the National trust of Australia and the Shire of Dardanup will be consulted prior to further disturbance. This will ensure sites are evaluated and appropriate management actions are developed.

11.3. Transport

11.3.1. Objective

To ensure that traffic activities resulting from the Project can be managed to an adequate level of public safety and have minimal impact on surrounding neighbours and landowners and traffic congestion.

11.3.2. Relevant Standards

As there are no regulatory standards, the factor is to be assessed against the objective.

11.3.3. Issue Definition

HMC will be transported using pocket road trains from Burekup to Capel. To satisfy the production schedule, an estimated maximum of 24 completed trips (48 movements per day) will be required. This could be configured as either four truck combinations completing six return trips per day, or eight truck combinations completing three return trips per day.

Additional traffic has the potential to add noise, amenity and safety issues.

11.3.4. Assessment and Management

Traffic studies have been undertaken, in consultation with the Shire of Dardanup, to identify transport routes where impacts upon public safety, road use and amenity can be minimised (Wyntak, 2007).

The proposed transport route from the mine is shown in Figure 23.

Current and expected average daily traffic movements are presented in Table 21.

Table 21: Average daily traffic movements

Road	Average Daily Traffic Movements				
	Pre-mine heavy movements	**Mining heavy movements**	**Pre-mine total movements**	**Mining total movements**	**% increase of total vehicle movements**
South West Highway	437.4	522.4	5 400	5 448	< 1%
Bussell Highway	400	448	8 350	8 398	< 1%

Increased traffic along the South West and Bussell Highways is minimal. However, there will be substantial increases in traffic movements along Dowdells Line Road (travel distance approximately 3.5 kilometres), which is attributable to considerably lower baseline traffic. All roads on the selected route are designated heavy haulage routes. Dowdells Line Road is currently used by Doral to access their Dardanup Mineral Sands Mine adjacent to the Project.

During construction, some disruption to normal traffic flows will be caused by transport of the concentrator and other support infrastructure to site. Transporting oversize loads to site such as the concentrator during construction will be coordinated with MRWA and the Shire of Dardanup to ensure an adequate level of public safety.

Closure of several Shire roads will be required. These include

- Dowdells Line Road from O'Conner Road to St Helena Road;
- Edwards Road for 850 metres east of Dowdells Line Road;
- St Helena Road for 950 metres west of Dowdells Line Road; and
- A portion of Harris Road at the southern end of the site may be required to be closed.

Due to these road closures, several road diversions will be required. These include:

- A road diversion will be installed from O'Conner Road in the north, past Edwards Road, to Dowdells Line Road in the south, re-connecting traffic on O'Conner and Edwards roads to Dowdells Line Road at the southern end; and
- A small diversion of Harris Road may be implemented at the southern end of the site, to allow the continued use of this Road

Traffic impacts are minimal, with some short term disruptions expected to traffic flow. Appropriate design of intersections and diversions in liaison with the Shire of Dardanup will ensure that traffic activities can be managed to an adequate level of public safety and have minimal impacts on surrounding neighbours and landowners and traffic congestion.

Through liaison with MRWA and the Shire of Dardanup and management of trucking operations, Iluka will ensure that the objective to adequately manage public safety and have minimal impact on surrounding neighbours and landowners and traffic congestion is achieved.

11.4. Visual Amenity

11.4.1. Objective

The objective is to ensure that the aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape to as low as reasonably practicable.

11.4.2. Relevant Standards

As there are no regulatory standards, the standard is to be assessed against the objective.

11.4.3. Issue Definition

Several properties and residences have views of the Project area. However, the Project is not adjacent to a major roadway and is not visible from the township of Burekup.

11.4.4. Assessment and Management

Iluka will minimise visual impacts to neighbours through the following measures:

- Retention of as much established vegetation as possible;
- Vegetating topsoil bunds;
- minimising the area disturbed;
- maintaining the site in a neat and tidy condition;
- keeping plant and equipment in good presentable order;
- designating areas for disused equipment (i.e. pipe and conveyor lay down areas);
- implementing dust suppression measures;
- implementing measures to minimise light overspill and glow; and
- completing rehabilitation as soon as possible following mining.

Implementation of the above management practices will ensure that the objective to consider aesthetic values and adoption of measures to reduce visual impact on the landscape to as low as reasonably practicable is achieved.

12. ENVIRONMENTAL OFFSETS

Offsets for the Project have been designed with consideration of the following principles in accordance with EPA Position Statement No. 9: Environmental Offsets:

1. Environmental offsets will only be considered after all other reasonable attempts to mitigate adverse impacts have been exhausted.

2. The offset package will address both direct offsets and contributing offsets.

3. Offsets will ideally be 'like for like or better'.

4. Positive environmental offset ratios will apply where risk of failure is apparent.

5. A robust, consistent and transparent assessment process will be utilised to develop the offsets package.

6. Offsets will meet all statutory requirements.

7. Offsets will be clearly defined, transparent and enforceable.

8. Offsets will provide a long lasting benefit (EPA, 2006).

The EPA Position Statement states that environmental offsets should only be considered where on-site mitigation has been reasonably considered or demonstrated, and where residual adverse impacts are considered significant – but not significant enough to make the project unacceptable. The impact mitigation sequence has been followed for each environmental factor for the Project as outlined below.

1. Avoid – the economic value of the contained mineral located within the areas of native vegetation is considerable in the context of the project; these areas are integral to the overall project economics. While vegetation within the mine pit cannot be avoided, mining related infrastructure has been located to avoid native vegetation wherever possible.

2. Minimise – where vegetation cannot be completely avoided, infrastructure has been located in areas of poor quality vegetation in preference to higher quality vegetation.

3. Rectify – commensurate areas of native vegetation will be rehabilitated to native vegetation following mining.

4. Reduce – adverse impacts will be minimised by commencing rehabilitation as soon as possible. The impact will be eliminated following mining.

5. Offset – direct offsets identified for Burekup include planting of an additional 20% of the condition 5 trees removed. This will result in a net environmental benefit from implementation of the Burekup Mineral Sands Project.

13. CLOSURE AND REHABILITATION

A noticeable impact of Iluka's activities is disturbance to the landscape during the mining phase. Recognising mining's role as a temporary land use, rehabilitation is required to restore, improve or develop the land into a landform that enables the next beneficial land use. To facilitate the transition from mining to a rehabilitated landscape, a Preliminary Rehabilitation Management Plan has been prepared (Appendix 4). The plan is consistent with EPA Guidance Statement No. 6 (EPA 2006a) requiring Environmental Impact Assessment (EIA) to include environmental significance and land, identify major limitations to rehabilitation and set rehabilitation objectives and definition.

Standard objectives for rehabilitation as defined by the EPA (2006) and adopted by Iluka are:

- Safe, stable and resilient landforms and soils.
- Appropriate hydrology.
- Providing visual amenity, retaining heritage values and suitable for agreed land use.
- Resilient and self sustaining vegetation comprised of local provenance species.
- Reaching agreed numeric targets for vegetation recovery.
- Comprising habitats capable of supporting all types of biodiversity.

Iluka plans to return the Project to an agricultural system with at least a comparable agricultural value to that before mining, and at least 3.6 ha of native vegetation rehabilitated to compensate for the clearing of condition 3 and 4 native vegetation, as well as planting trees to compensate for the clearing of paddock trees.

As part of Iluka's continuing operations, much of the infrastructure used for mining is relocated to the next project for mine development. Once items for re-use have been relocated, recyclable infrastructure will be removed by a salvage contractor leaving a landscape dominated by foundations and open areas.

Inert or structural waste that cannot be recycled will be excavated and placed in an inert landfill created at the base of the remaining open pit. The foundations around workshops, refuelling areas, laydown areas and below fixed plant will be investigated for the potential of contamination. Where contaminated material is encountered, it will be excavated for remediation. Internal (Iluka owned) powerlines will be removed.

Clay material stored within the solar drying dams and any remaining overburden stockpiled or as part of noise bunds will be transferred into the remaining open pit, effectively removing the solar drying dams as structures in the landscape.

After completion of decommissioning infrastructure, the site will be ready to commence rehabilitation on the remaining open area.

A Preliminary Rehabilitation Management Plan has been developed (Appendix 4). A Final Rehabilitation Management Plan will subsequently be prepared, amended as necessary and implemented in consultation with relevant stakeholders including the EPA, DEC and relevant landholders.

14. CONCLUSION

The impact assessment concludes that development and operation of the Project can be conducted without causing significant environmental impacts. The project has been considered utilising the sustainable development principles of ecological, social and planning options. Impacts or potential impacts have been identified, with alternatives evaluated during project definition to avoid impacts wherever possible and management controls developed for implementation during construction and operations to minimise these impacts.

Iluka has made the following commitments in this EPS:

- Implement the Vegetation and Flora Management Plan
- Implement the Water Management Plan
- Implement the Noise Management Plan
- Implement the Preliminary Rehabilitation Management Plan
- Develop a Final Rehabilitation Management Plan
- Implement the Final Rehabilitation Management Plan
- Implement the offsets

Through implementation of the Management Plans, environmental impacts will be minimised and/or mitigated.

Development of this project is a continuation of Iluka's South West operations which benefits the community through infrastructure support, partnerships with local government and communities and continued employment of a local workforce. Iluka's Southwest operations contribute to the local economy through local expenditure and investment in capital and people. These benefits flow to both the State and Commonwealth, through royalties, payroll, income and other indirect taxes and duties. The sum of these benefits makes a compelling argument for approval to develop the Burekup Mineral Sands Project.

Iluka is committed to managing the proposal so that impacts on the environment are minimised.

Table 22 outlines the commitments made by Iluka to achieve this outcome.

Table 22: Summary of Environmental Factors

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
BIOPHYSICAL					
Landform and Soils	To maintain the integrity, ecological functions and environmental values of the soil and landform.	The landscape is flat to gently undulating with small localised rises separated by broad, low-lying depressions. Depressions seasonally inundated. 4 SMUs have been defined which reflect poorly drained soils of the Guildford Formation on the Pinjarra Plain	Disturbance to landforms will occur from the excavation of mining pits.	Topsoils, subsoils and overburden will be removed and stockpiled separately for backfill of mining voids to assist in recreating a soil profile that allows return to the pre-mine land use. A Preliminary Rehabilitation Management Plan has been prepared.	Reinstatement of landforms and soil profiles compatible with an agricultural landuse.
Groundwater	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected. To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	The area is partially within the Dardanup Groundwater Management Sub-area of the Bunbury Groundwater Area, and partially within unproclaimed groundwater area. Deposit lies within the superficial formation. 22 landowner bores occur in the nearby area. Variations of greater than 1 pH unit and up to 4 140 μ^{-1}.	Dewatering of pits and abstraction will cause localised groundwater drawdown. Surrounding landowner bores and dams unlikely to be affected, only one bore expecting reduction in groundwater levels greater than 1 m (1.3 m).	Groundwater drawdown and recovery has been modelled. A Water Management Plan and Operating Strategy has been prepared.	Groundwater levels are expected to return to within 1 m of pre-disturbance levels 8 months after mining is complete. Supply of water from landowner bores will not be affected.
Acid Sulfate Soils	To maintain the integrity, ecological functions and environmental values of the soil and landform.	Acid Sulfate Soil (ASS) study has identified no ASS within the mine pit. Potential Acid Sulfate Soils (PASS) are present below the base of the mine pit.	Very low potential for exposure of potential acid sulphate soils (PASS) as these are located below the base of the pit. Dewatering may result in oxidation of PASS below the pit.	Mining methods may be altered where the base of the pit is close to the underlying PASS to reduce groundwater drawdown needs, maximising saturation of PASS.	No impact from acid sulphate soils.

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Surface Water	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected. To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Project located within two sub-catchment of the Leschenault Estuary – Lower Collie catchment. Numerous small drains and irrigation channels occur within and near the Project. One conservation category wetland over 100 m from the pit One resource enhancement wetland over 500 m from the pit Both wetlands have existing disturbance. Quality measurements taken indicate pH ranged from 6.1 to 7.49 across the sites, and average electrical conductivity ranged from 235 µS/cm to 932 µS/cm.	Disturbance has the potential to affect water quality of surface water and run-off.	Control measures such as bunding, sumps and stormwater management systems implemented to prevent loss of water from disturbance areas to the surrounds. Any water discharges from mining operations will be licensed and regularly monitored.	Water release will be in accordance with licence conditions.
Vegetation and Flora	To maintain the abundance, diversity, geographic distribution and productivity of vegetation communities and flora at the species and ecosystem levels through the avoidance or management of adverse impacts and through improvement in knowledge.	The site has been extensively cleared for agricultural purposes, contains isolated trees and several areas of native vegetation Nine vegetation community types recorded, little good or very good vegetation, mostly associated with road reserves. C4 vegetation on Simpson Rd Reserve has dominant species similarities to TEC SCP 3a, but low overall floristic similarities. No DRF or priority flora recorded during surveys in 2005 and 2007 4 Declared Plants (weeds) recorded.	Mining operations will occupy 374.5 ha of land, 312 ha being completely cleared, 59 ha of degraded vegetation and 3.6 ha of good or very good condition vegetation. Low to moderate risk of groundwater drawdown impacts on 4.5 ha of vegetation.	Clearing of native vegetation will be restricted to the disturbance footprint. If groundwater drawdown reduces vegetation density, infill planting of species will be conducted A Vegetation and Flora Management Plan has been prepared A Preliminary Rehabilitation Management Plan has been prepared	No impact to potential TEC If groundwater drawdown impacts are experienced they will be limited to crown decline and/or succession of some species. Area will be rehabilitated to a predominantly agricultural system with comparable vegetation values to those present prior to mining.
Fauna	To maintain the abundance, diversity, geographic distribution and productivity of native fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	Degraded vegetation is of little habitat value to native fauna. Road reserve vegetation is too narrow and lacks linkages to be of significant benefit to native fauna. 20 avifauna, no native mammals, 3 frogs and 2 native fish recorded.	Potential loss of habitat. Potential impact very low due to lack of significant habitat	No specific management measures required. A Rehabilitation Management Plan has been prepared.	No significant impacts anticipated for fauna.
POLLUTION MANAGEMENT					

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Dust	To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	Potential for dust generation in relation to existing mining and agricultural land use.	Potential dust generation by earthmoving activities and exposed stockpiles and rehabilitated areas.	Dust will be controlled through a number of management practices which may include: • Minimise clearing and open areas; • Not disturbing topsoil until required; • Regular watering and grading of roads; • Using biodegradable chemical suppressants; • Stabilising bunds and stockpiles from wind erosion; • Growing temporary crops to bind soil and lift wind from surface; and • Re-establishment of pasture as soon as possible after mining has been completed.	No adverse impacts on environmental values or human health, welfare or amenity.
Noise	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.	Environmental background noise levels are typically 25-29 dB(A) (L90 of LA90) during both day and night hours. Existing mineral sands mine in immediate area.	Noise modelling indicates worst case conditions may result in exceedances at 5 nearby residences to Noise Regulations.	Construction of earth noise bunds. Installation of noise enclosures. Mobile equipment fitted with directional broadband white noise alarms. Neighbour agreements to be in place prior to commencement of mining. A Noise Management Plan has been prepared.	Activities will be in accordance with Noise Regulations most of the time. Landowner and neighbour agreements will be in place to address noise amenity.
Radiation	To ensure that radiological impacts to the public and the environment are kept as low as reasonably achievable and comply with acceptable standards.	Pre-mine radiation survey will be conducted prior to disturbance.	Exposure to low level radioactive minerals.	Implement South-West Radiation Management Plan	Handling, storage and transport of ore and HMC able to be conducted safely. Post mining values will be similar to the pre-mining value.
Light	To avoid or manage potential impacts from light overspill and comply with acceptable standards.	Several residences and roads nearby are potential light receptors.	Night lighting may affect nearby residents and traffic	In-pit hopper, screen plant and concentrator to be located below natural surface level or behind constructed bunds to minimise nuisance light. The majority of earthmoving activities will be conducted between 6 am and 7 pm. Light towers will be erected so as to concentrate light on work areas.	No significant adverse impacts from site lighting.
Non-process Waste	Ensure that wastes are managed and disposed of in a manner that does not result in long-term impacts on groundwater, surface water and the natural environment.	NA	Mismanagement of waste creates large waste streams that are difficult or environmentally unacceptable to dispose or creates contamination.	Encourage use of landfill alternatives. Ensure non-process waste streams disposed of appropriately.	No long term impacts from non-process waste.

Environmental Factor	Objective	Existing Environment	Potential Impact	Environmental Management	Predicted Outcome
Process Waste	Ensure that waste streams from the process are returned to the mining void in a manner that allows the re-creation of the original landscape and landuse.	NA	Inappropriate handling of process wastes may affect landform reestablishment.	Ensure process waste streams handles appropriately. A Rehabilitation Management Plan has been prepared.	Return of process wastes to pits will result in re-establishment of the pre-mining land use.
Greenhouse Gases	To minimise emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions.	Project is a continuation of operations in the Southwest of WA.	Emission of greenhouse gases directly and indirectly as a result of mining and mining-related activities.	Ensure efficient use of all machinery. Monitor and report greenhouse gas emissions in Annual Environmental Report.	Greenhouse gas emissions will not be significantly altered.
SOCIAL ENVIRONMENT					
Aboriginal Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	No archaeological or ethnographic sites were found within the disturbance area. An ethnographic site occurs outside of the disturbance area	Potential for discovery of aboriginal heritage sites within the disturbance area. The Ethnographic site outside of the disturbance area will not be impacted.	Provisions of the Aboriginal Heritage Act will be complied with. If any sites are discovered during operations will be reported to DoIR and DIA.	No impact to Aboriginal heritage and compliance with the Aboriginal Heritage Act 1972.
European Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	No European heritage sites identified at Burekup	No impact identified.	Any site discovered during operations will be reported to the DoIR and the Shire of Dardanup	No impact to European heritage
Transport	To ensure that traffic activities resulting from the Project can be managed to an adequate level of public safety and have minimal impact on surrounding neighbours and landowners and traffic congestion.	The key transportation corridors are Dowdell's Line Rd (currently used for existing mining operation), South-West Highway, Robertson Rd and Bussell Highway (MRWA heavy haulage routes). Transport will comprise of four pocket road trains, totalling 48 movements (24 completed trips a day), operating 24 hours a day.	Additional heavy traffic has the potential to impact noise, amenity and public safety. Construction traffic (wide loads) may cause short term disruptions to traffic. Several roads will require closure and/or diversion to construct and operate the Project	Liaison with the Shire of Dardanup and MRWA to minimise disruption to traffic. Ensure new diversions and intersections are appropriately designed. Use of designated heavy haulage routes.	Some short term disruption to traffic during construction, and during closure and diversion of roads Minimal disruption to traffic from transport of heavy mineral to Capel.
Visual Amenity	The objective is to ensure that the visual amenity of the area adjacent to the Project is not unduly affected by the proposal.	Agricultural and adjacent mining land use, thus there is a minimal number of residences in close vicinity to the Project area.	Several of the nearby residences will have views of the Project. The township of Burekup will not have views of the Project.	Minimise clearing. Topsoil bunds to be vegetated. Conduct rehabilitation to agreed final landuse.	Visual impact will be reduced to as low as reasonably practical.

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16. ABBREVIATIONS

AASS	Actual acid sulfate soil
ANZECC	Australian and New Zealand Environment Conservation Council
ANZMEC	Australia and New Zealand Minerals and Energy Council
ASS	Acid sulfate soil
CAMBA	*Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment*
DEC	Department of Environment and Conservation
DIA	Department of Indigenous Affairs
DoE	Department of Environment (now DEC)
DOCEP	Department of Consumer and Employment Protection
DOIR	Department of Industry and Resources
EIA	Environmental Impact Assessment
EIL	Ecological Investigation Level
EPA	Environmental Protection Authority
GWh	Gigawatt hours
HMC	Heavy Mineral Concentrate
JAMBA	*Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment*
MCA	Minerals Council of Australia
PASS	Potential acid sulfate soil
PB	Parsons Brinckerhoff
PER	Public Environmental Review
RD	Habitat specialists with a reduced distribution
RP	Wide-ranging species with reduced population
RIWI Act	*Rights in Water and Irrigation Act 1914* (WA)

SMU	Soil Management Unit
SWC	Soil Water Consultants
SWDC	South West Development Commission
TAA	Total Actual Acidity
TEC	Threatened Ecological Community
WAPC	Western Australian Planning Commission
WC Act	*Wildlife Conservation Act 1950* (WA)
WRC	Water and Rivers Commission (now DoW)
WRM	Wetland Research and Management

17. GLOSSARY

Drawdown	A decline in the groundwater level due to abstraction
FeS_2	Pyrite
pH_F	Field pH
pH_{FOX}	Field peroxide pH
Piezometer	A small diameter cased bore used for water level measurements
Rehabilitation	Re-establishing pre-mining values in areas disturbed by Iluka operations
S_{CR}	Chromium Reducible Sulphur
Soil profile	Cross-sectional view of the horizons in a soil

APPENDIX 1
Water Management Plan and Operating Strategy

ILUKA

Iluka Resources Limited

Water Management Plan & Operating Strategy

Burekup Mineral Sands Project

November 2007

ILUKA-TR-

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1. INTRODUCTION

This plan relates to the management of water impacts at the proposed Burekup mineral sands mine. The plan has been developed in conjunction with the Environmental Protection Statement (EPS). Implementation and compliance with this plan during operations is a commitment of the Burekup EPS document.

This plan is also designed to fulfil the requirements of an Operating Strategy to support an application to the Department of Water (DoW) for a Groundwater Well Licence for proposed dewatering at Burekup. The purpose of an Operating Strategy is to detail Iluka's commitments to managing the impacts of dewatering, including describing the water source(s) to be used; water abstraction regime and infrastructure, monitoring and reporting commitments; methods proposed to manage impacts on the environment and other water users, contingency plans, and water efficiency measures employed. This plan is to be in place for the duration of the Burekup mine.

2. ENVIRONMENTAL OBJECTIVE

The objective of this plan is to maintain, to the maximum extent practicable, the integrity, functions and environmental values of water bodies and the quantity and quality of groundwater within and adjacent to the project area.

3. PRE- MINE ENVIRONMENT

The proposed mine is located to the south of the South Western Highway, approximately 11 km east of Bunbury and 150 km south of Perth, in the Shire of Dardanup (Figure 1). The Project is situated on the Swan Coastal Plain on mining tenements M70/652 and M70/720, between Henty Brook Road and Waterloo-Dardanup Road (Figure 2).

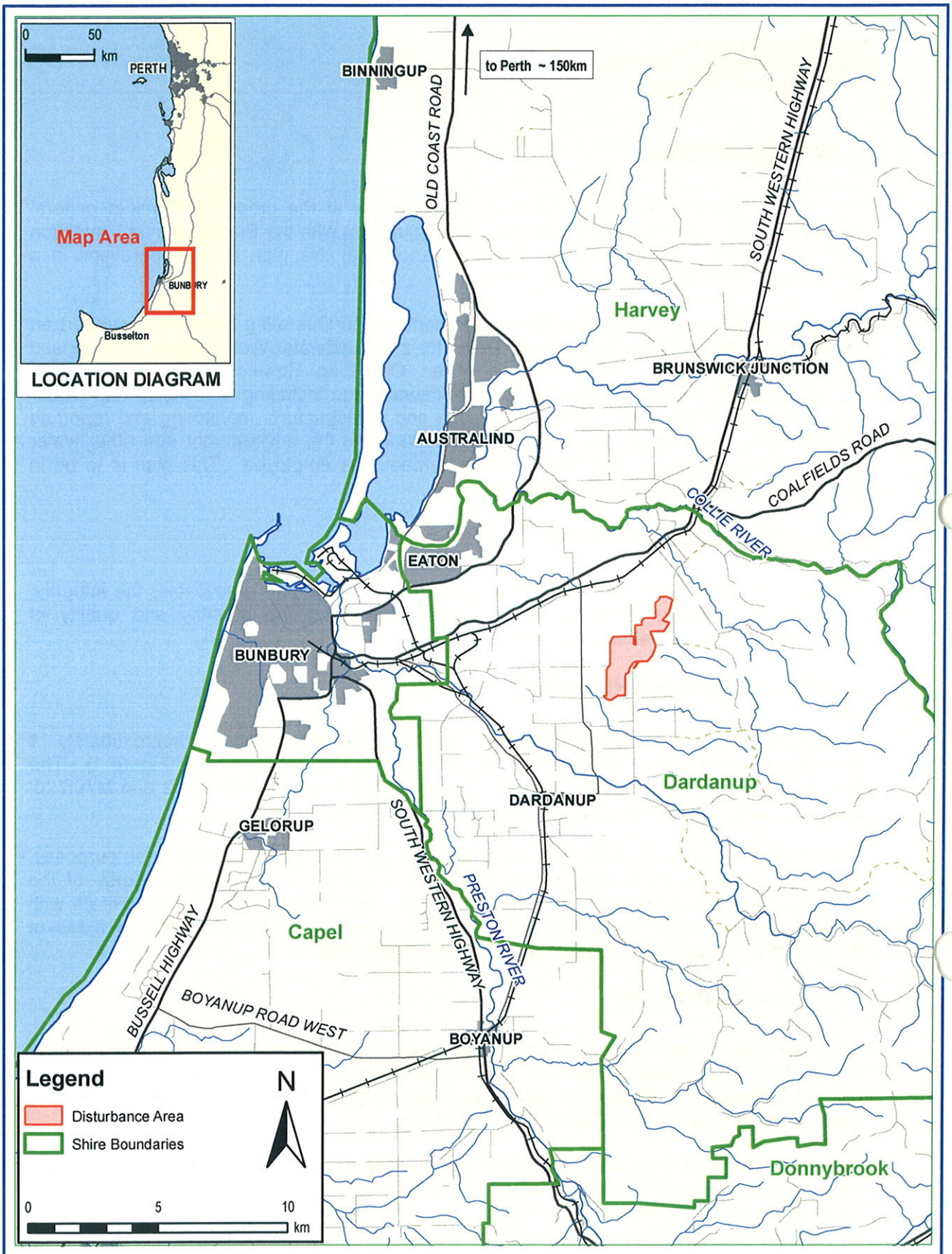
The Project disturbance area is largely cleared for grazing and agricultural purposes. Several agricultural water supply drains traverse the Project. While the majority of the proposed disturbance area is owned by Iluka, there are five other private landowners with property partially or wholly within the proposed disturbance area. Approximately 1 km east of the proposed mine is Doral's Dardanup minerals sands mine.

3.1. Groundwater

The Project is partially situated within the Dardanup Groundwater Management Sub-area of the Bunbury Groundwater Area, and partially within unproclaimed groundwater area. The division between the proclaimed and unproclaimed groundwater areas is Dowdells Line Road (Parsons Brinckerhoff (PB), 2007) (Figure 3).

An initial study was conducted in 2006 to characterise the local groundwater environments based on knowledge of the local geology and groundwater systems and experience at other Iluka deposits in the region (PB, 2006). As part of these investigations, 11 superficial piezometers and five Leederville piezometers were installed in April 2006.

The deposit lies within the superficial formations which are made up of the Guildford Formation and Yoganup Formation. The superficial formations are underlain by the Leederville Formation and the Yarragadee Formation (PB 2007). The Superficial and Leederville aquifers are described below.



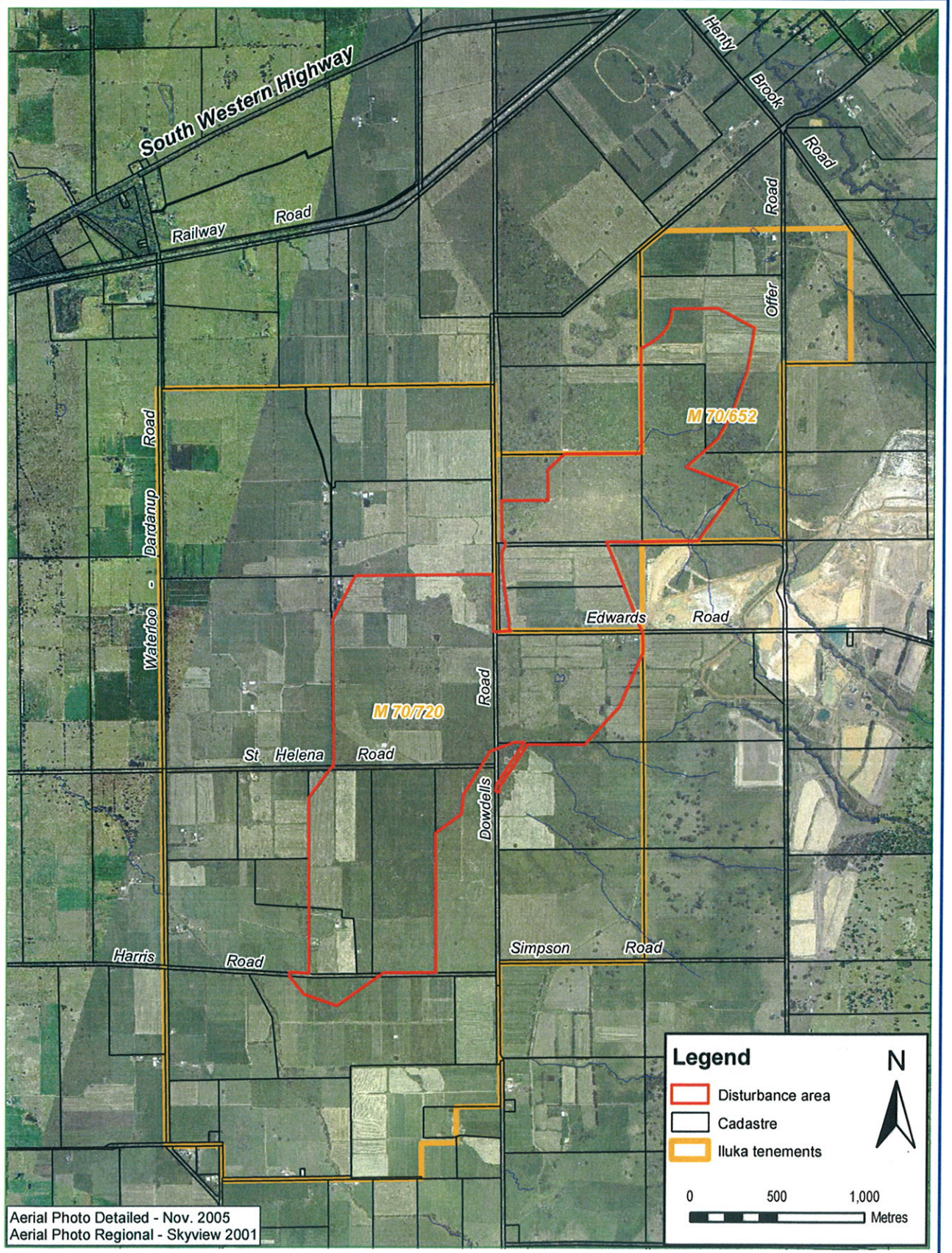
BUREKUP

REGIONAL LOCATION PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:200,000 (A4) DATE: 23 Nov. 2007 DWG No: 170435 ver.02

FIGURE: 1



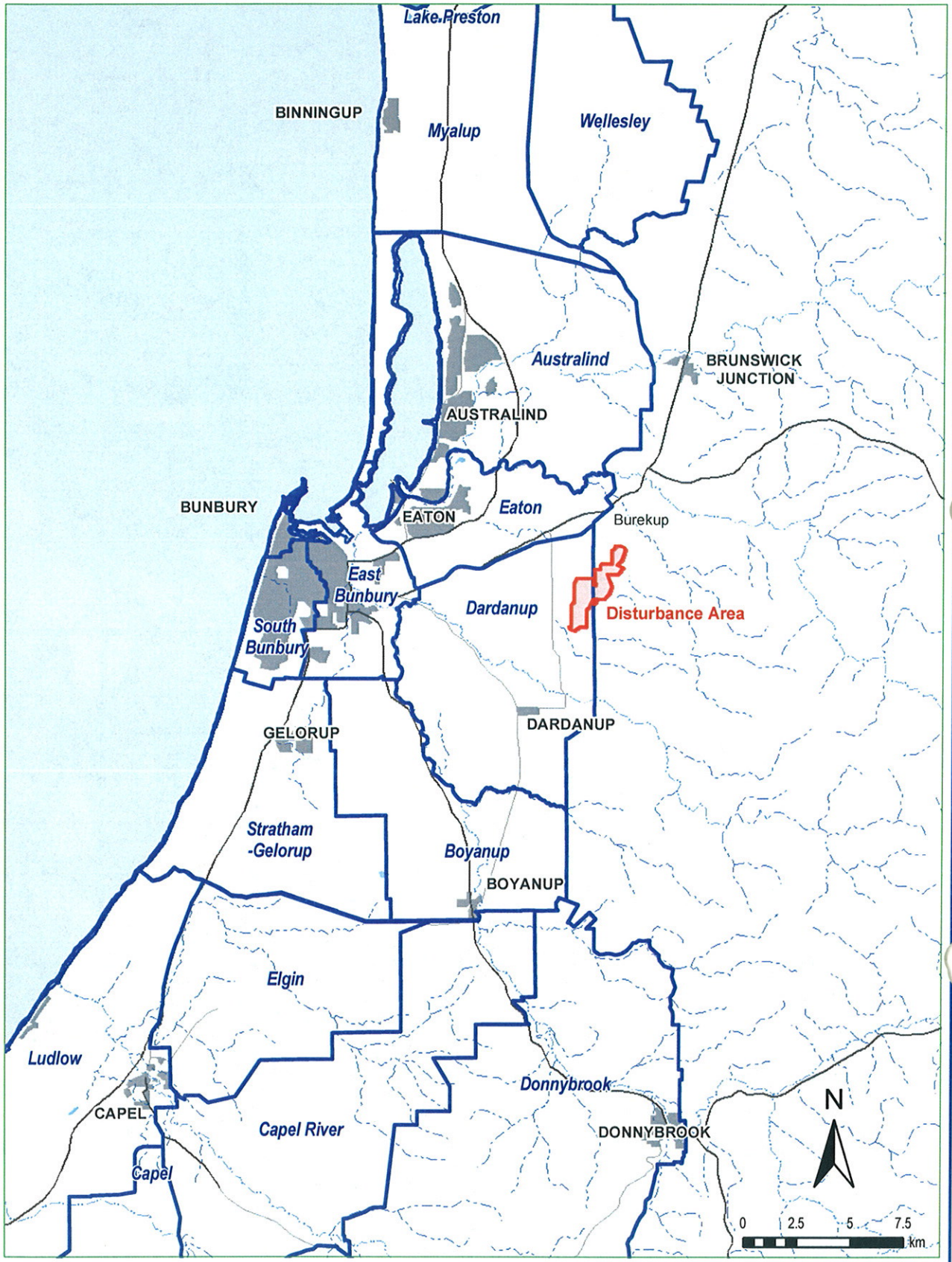
BUREKUP

SITE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 170439 ver.03

FIGURE: 2



Legend

- Disturbance area
- Ground Water Subareas

BUREKUP

GROUNDWATER MANAGEMENT AREAS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:250,000 (A4) DATE: 23 Nov. 2007 DWG No: 176623 ver.02

FIGURE: 3

3.1.1. Superficial Formations

The superficial formations are made up of the Guildford Formation and Yoganup Formation. The Guildford Formation is a continuous unit over much of the site, ranging in thickness from 6 m at the centre of the deposit to an average 20 m thick towards the western boundary. The formation is comprised of clay and silt. The contact between the Guildford Formation and the underlying Yoganup Formation slopes gently to the west, ranging from 28 mAHD closest to the scarp to 8 mAHD on the western side of the deposit. The Yoganup Formation is sand dominated ranging from 1 m to 6 m thickness across most of the deposit, but reaches 11 m thickness in the south west. In the north of the site, the Yoganup Formation contains clay levels similar to Guildford Formation clay levels (N. Northcott, pers. comm.), therefore for the purposes of groundwater modelling, the northern extent of the Yoganup Formation is considered to be Guildford Formation (PB 2007).

The superficial formations contain limited groundwater resources. Groundwater modelling indicates that the hydraulic head in the superficial aquifer is between 0.1 m and 6 m below ground level, with some surface areas being inundated during the winter months. Transmissivities range between 0.5 m^2/day to 79.1 m^2/day. The highest transmissivities represent the sandy Yoganup Formation. The high clay content of the Guildford Formation results in ponding during winter. Groundwater flow is generally toward the coast (north-west), mimicking the topography (PB, 2007).

The superficial aquifer is directly recharged by rainfall and localised upward leakage from underlying aquifers. Discharge from the aquifer occurs as baseflow to surface drainage, coastal wetlands, rivers, evapotranspiration and downward leakage (PB, 2007).

3.1.2. Leederville Formation

The contact between the superficial and Leederville Formations slopes gently north-west, ranging from 26 m AHD near the scarp to 4 m AHD on the western side of the deposit (PB, 2007).

The Leederville Formation is absent to the north of the site, and thins and pinches out toward the west over the Bunbury Basalt, though there is no known basalt beneath the deposit. The formation overlaps the Darling Fault to the east. The Leederville aquifer is between 150 and 200 m thick. Beneath the Leederville Formation lies the Yarragadee Formation (PB, 2007).

Hydraulic heads measured in piezometers screened in the Leederville aquifer are similar to those in the superficial aquifer. The transmissivity of the Leederville Formation ranges between 4.9 m^2/day to 46 m^2/day and also flows north-west, toward the coast. This aquifer is hydraulically isolated from the superficial aquifers in areas where a grey clay and silt horizon is present, however where this horizon is absent, there may be some connectivity between the formations, leading to upward leakage (PB, 2007).

Regional Leederville recharge is from infiltration of rainfall on the Blackwood Plateau to the south and localised downward leakage from the superficial aquifer or upward leakage from the Yarragadee aquifer. Discharge is to the superficial and Yarragadee aquifers and the ocean (PB, 2007).

3.1.3. Groundwater Supplies and Users

The Burekup deposit is partially situated within the Dardanup Groundwater Management Sub-area of the Bunbury Groundwater Area, and partially within unproclaimed groundwater area, with Dowdells Line Road the boundary. The Bunbury Groundwater area is a gazetted groundwater area, with the conservation, management and protection of all water resources vested in and administered by the State in accordance with the *Rights in Water and Irrigation Act* 1914. The current allocation limit for the Dardanup sub-area superficial aquifer is 500,000 kL/annum, of which 7 % (35,000 kL) is currently allocated.

Iluka conducted a groundwater resource census of 20 landowners within approximately one kilometre of the Burekup deposit, collecting information on bores and dams. 22 bores and 10 dams were noted. All dams are fed by windmills, bores or surface flows. Bore construction and groundwater level information available was limited. Bores and dams are used for stock watering, irrigation, dairy and household purposes.

3.1.4. Groundwater Quantity and Quality

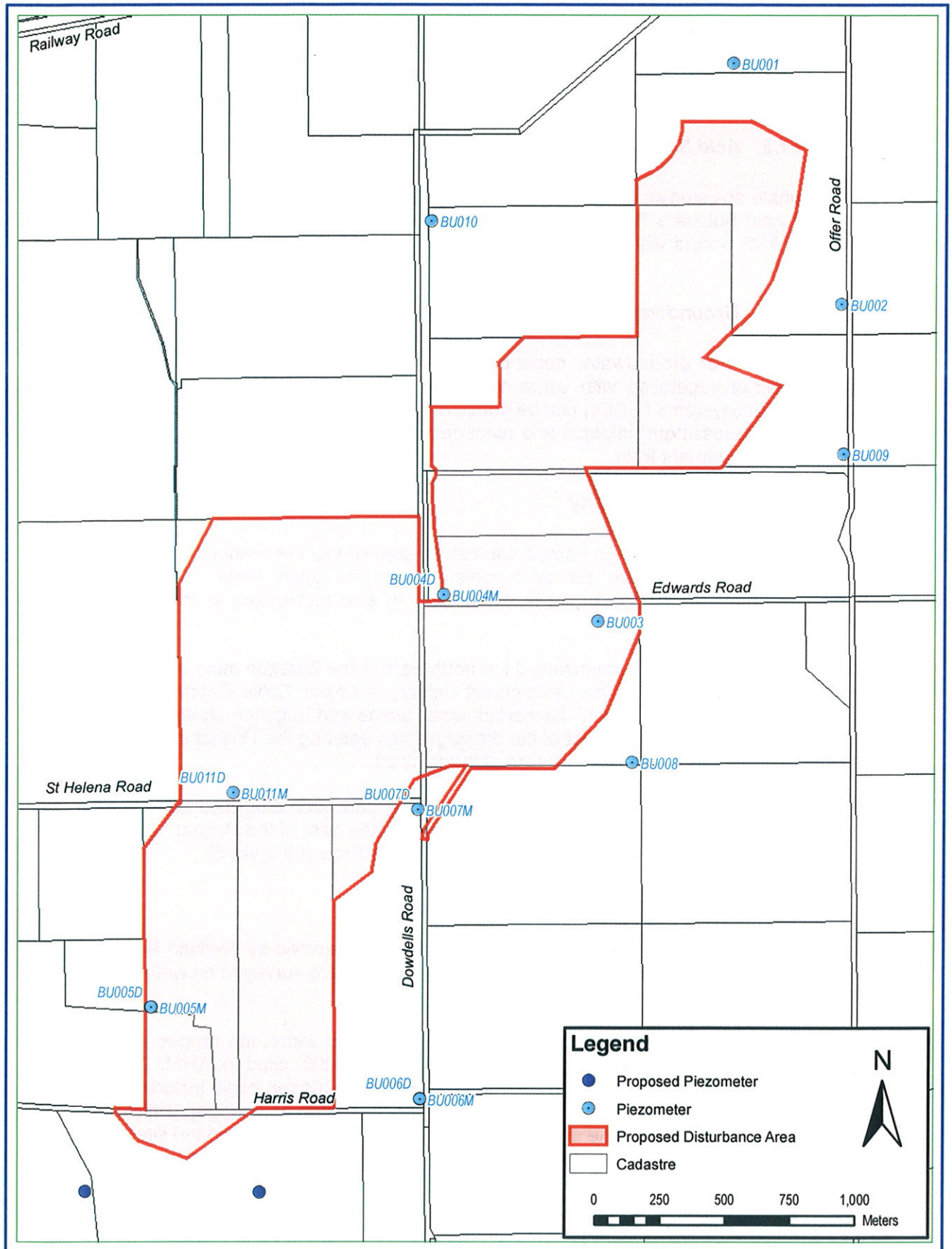
A piezometer network exists across the site (Figure 4). Groundwater quality in the superficial formations ranges from fresh to brackish, depending on the proximity to recharge areas and the local lithological composition (PB, 2007).

Standing water levels in the piezometers have been monitored monthly since August 2006 and seasonal fluctuations of up to 2.83 m within individual piezometers have been observed to date. The maximum depth to water for bores in the superficial aquifer was 6.27 m below surface at BU001, whilst the deepest depth to water measured in the Leederville aquifer was 5.16 m below ground level at BU006D. Variations of greater than one pH unit and up to 4,140 μScm^{-1} at individual piezometers have been observed in field data to date. The scale of variation of groundwater quality across the piezometer network can also be seen from the ranges below:

- Superficial Aquifer
  - pH 3.92 (BU008) to 5.97 (BU010)
  - EC 686 μScm^{-1} (BU009M) to 14,600 μScm^{-1} (BU001)
- Leederville Aquifer
  - pH 4.40 (BU005D) to 6.31 (BU004D)
  - EC 703 μScm^{-1} (BU011D) to 3,290 μScm^{-1} (BU005D)

Of note are low pH results that were observed in some piezometers. Whilst most piezometers have pH values below 6, BU008 consistently had pH values below 4.5. This piezometer is known to be screened in PASS. It is located approximately 800 m east of the mine pit where PASS is has been found occurring closer to the surface than in the mine pit area (see section 3.1.5). Three other piezometers have recorded pH values below 4.5 (BU001, BU005D and BU009), though this is believed to be due to natural variation. These piezometers are not screened in PASS material. Plots of groundwater trends and raw data collected up to September 2007 are presented in Appendix 1.

Chemical analyses of groundwater has yielded no discernable trends to date other than substantial ranges in water quality between piezometers. Iron was found to exceed the 95% level of protection for freshwater systems, whilst iron and manganese exceeded irrigation trigger levels. Appendix 2 contains the raw data from water quality analyses.



BUREKUP

GROUNDWATER PIEZOMETERS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000(A4) DATE: 23 Nov. 2010 DWG No: 178374 ver.00

FIGURE: 4

3.1.5. Acid Sulphate Soils

Acid sulphate soil studies indicate that no acid sulphate soils are present within the mine pit. Potential Acid Sulphate Soils (PASS) were located below the base of the mine pit. At its closest, PASS occurs within 1 m below the base of the mine pit. No AASS is present at Burekup.

3.1.6. Groundwater Dependent Ecosystems

An assessment of groundwater dependency has been conducted at Burkeup identifying seven areas of vegetation with some degree of groundwater dependency. Groundwater Dependent Ecosystems (GDEs) can be affected by groundwater drawdown which is required for mining. Assessment, impacts and management of GDEs is included in the Vegetation and Flora Management Plan.

3.2. Surface Hydrology

The Project lies within two un-named sub-catchments of the Leschenault Estuary – Lower Collie Catchment. The two sub-catchments drain to the Collie River. The Leschenault Estuary – Lower Collie Catchment is 914.65 km² in size and drains to the Indian Ocean (Figure 5).

Henty Brook is located approximately 3 km north east of the Burekup mine pit within another unnamed subcatchment of the Leschenault Estuary – Lower Collie Catchment and flows north west into the Collie River. Numerous small drains and irrigation channels are located within and near the Project. Most of the drainage lines entering the Project from the east are diverted to channels on the western side of the mine pit.

The Burekup area, including the Project, has in most part been classified as a multiple use wetland. One conservation wetland (UFI 2362) is located east of the Project. One resource enhancement wetland (UFI 2165) is located north of the Project (Figure 6).

3.2.1. Surface Water Quality

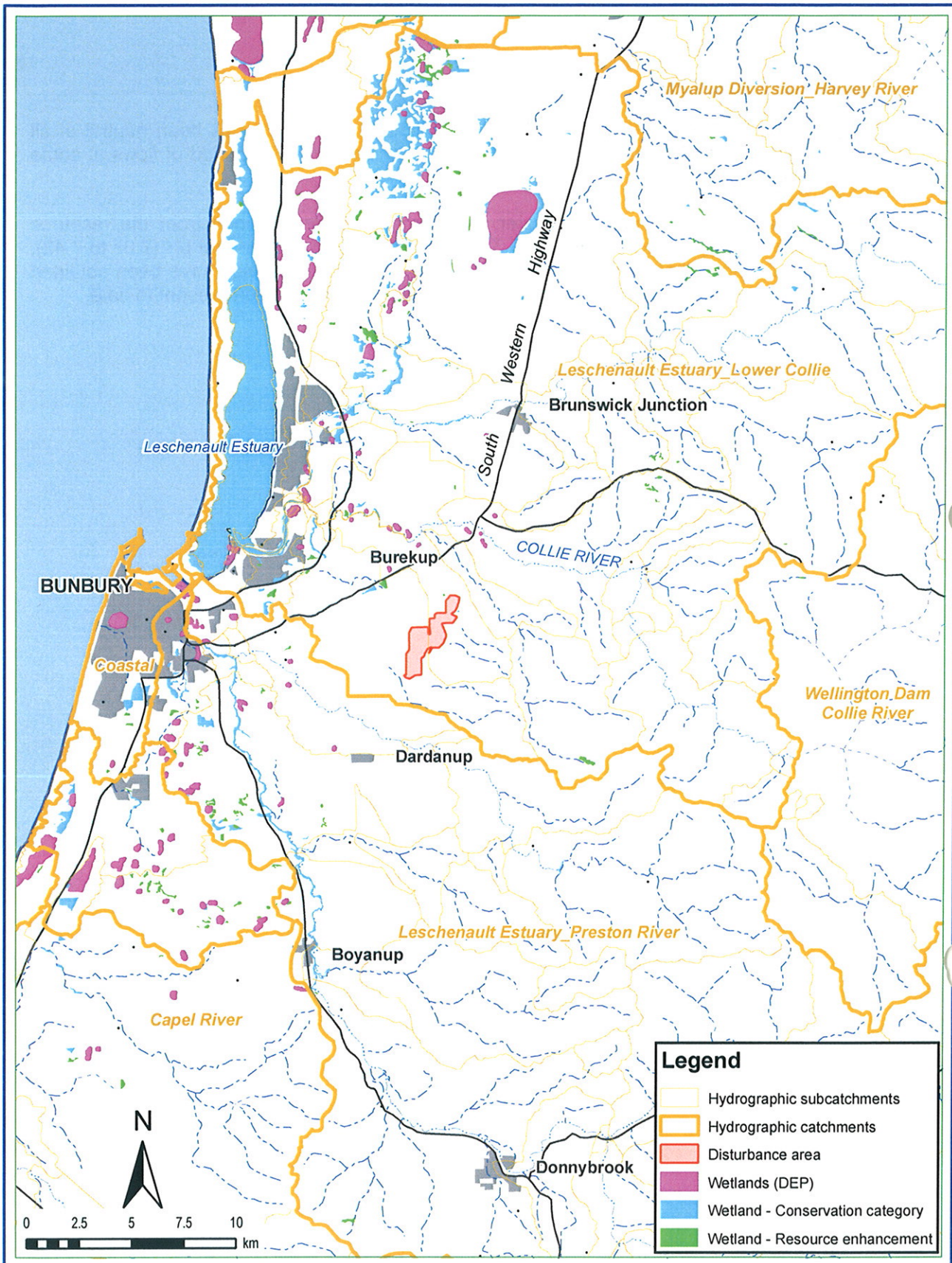
A survey of aquatic ecosystems within the Project was conducted by Wetland Research and Management (WRM) in spring 2005 (WRM, 2006). Sites were surveyed on wetlands and the Henty Brook (Figure 6).

Physical and chemical variables measured were generally within the ranges expected for 'slightly to moderately disturbed' ecosystems (ANZECC, 2000, cited in WRM, 2006). Sites B3 and B9 (multiple use wetlands) exceeded a number of trigger levels including dissolved oxygen, total nitrogen, total phosphorous, aluminium, cadmium and copper, whilst pH varied from 6.15 to 7.49. The riverine sites of Henty Brook differed from the wetland sites by having greater water depth and lower total phosphorus, metals and electrical conductivity than the wetland sites.

Iluka has established surface water monitoring sites at the resource enhancement and conservation category wetlands (BUS1 and BUS2 respectively), and at four sites where drains enter or exit the site (BUS3, BUS4, BUS5 and BUS6) (Figure 6). Chemical analyses of surface water has shown exceedances of the 95 % level of protection for freshwater systems for total nitrogen, total phosphorous, aluminium and zinc in the agricultural drains. Concentrations of metals did not exceed trigger levels for livestock. Electrical conductivities

ranged from 235 μScm^{-1} (BUS8) to 932 μScm^{-1} (BUS3), whilst pH has been neutral at all sites ranging from 6.5 to 7.5. Sample data has been limited by the period of flows at some surface water sites.

Due to a lack of water, only two water samples have been obtained from the resource enhancement category wetland to date. These samples showed a neutral pH (7.07 to 7.42), and low EC ranging between 189 and 255 μScm^{-1}. No water samples have been obtained from the Conservation Category wetland as insufficient water has been present to date.

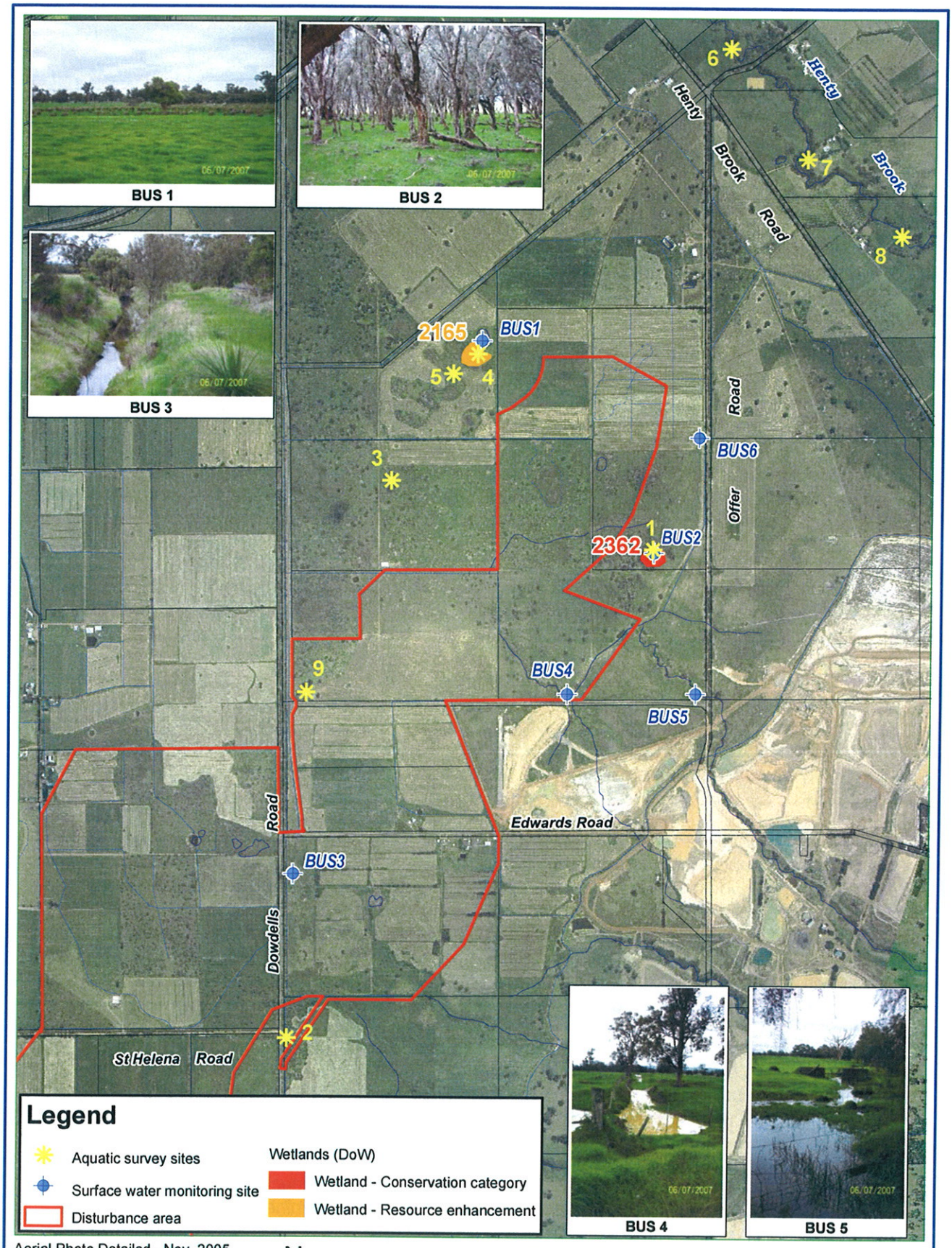


BUREKUP REGIONAL SURFACE WATER CATCHMENTS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:250,000 (A4) DATE: 23 Nov. 2007 DWG No: 176620 ver.02

FIGURE: 5



BUREKUP

LOCAL SURFACE WATER SYSTEMS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 23 Nov. 2007 DWG No: 176622 ver.02

FIGURE: 6

4. POTENTIAL IMPACTS

As part of proposed mining activities at Burekup, Iluka will need to conduct dewatering to enable dry mining activities, and excavate some of the agricultural drains that cross the disturbance area. Water will also be required for use in processing. The result of these and other mining activities has the potential to impact water resources in a number of ways described below.

4.1. Physical/Chemical Impacts

Dewatering of mine pits causes localised lowering of water levels and requires the management of extracted water.

There are expected to be times of excess water on site from rainfall interception and dewatering requiring release. Discharge water has the potential to adversely impact downstream water quality, cause erosion and change flow regimes if not appropriately controlled.

Potential contaminants to surface and groundwater include hydrocarbons and flocculants. The most likely potential sources for contamination include the concentrator area, screen plant, mine workshop, vehicle washdown bay, fuel bays and refuelling areas.

In addition to these active sources of contamination, mining is expected to occur within 1 m above PASS occurring below the base of the pit. Physical disturbance to PASS is not required at Burekup. Exposure of PASS below the pit to oxygen through dewatering activities may result in the release of acidity. The impacts of acidity can include increased toxicity and bioavailability of metals, deterioration of vegetation quality and reduced soil fertility.

The groundwater assessment conducted by PB (2007) aimed to determine the extent of potential impacts on the groundwater system due to mining. A model was created to estimate the volume of water extraction from the mine pit to allow dry mining to occur; and the potential drawdown effect on surrounding water levels. This information has been used in conjunction with information derived from a landowner bore census, soil studies, vegetation studies and wetland studies to determine the potential impact on nearby water users.

Groundwater inflow rates during the mining operations depend on the time of the year and the depth of mine block excavation. Inflows over the life of the mine are expected to vary from 8.2 L/s to 56.8 L/s. Monthly aggregate abstraction volumes area expected to range from 21 ML (based on minimum inflow rates) to 56 ML (based on maximum inflow rates) (PB, 2007)

The model estimated annual inflows ranging between 600 ML and 1300 ML, with an average annual inflow of approximately 900 ML. Using average anticipated inflows, the model estimated a total of 1,600 ML of groundwater will flow into the mine pits over the mine's life.

Lowering of hydraulic head is predicted to centre on the active mine blocks and recover rapidly after backfilling. Due to the low conductivity of the Guildford Formation, the drawdown gradient is predicted to be significantly steeper in the superficial aquifer than in the Leederville aquifer.

Within the Guildford Formation, it is predicted that a lowering of hydraulic head will be apparent almost immediately. The hydraulic head within the Guildford aquifer is predicted to decrease by up to 8 m adjacent to the active mine area; and to 1 m at a maximum distance of 980 m from the mine pit, adjacent to the in-pit hopper (mine block 19).

Within the Leederville Formation, it is predicted that a lowering of hydraulic head will be first seen three months after mining commences. The hydraulic head within the Leederville aquifer is predicted to decrease by up to 3 m at the centre of the mine; and to 1 m at a maximum distance of 980 m from the mine pit.

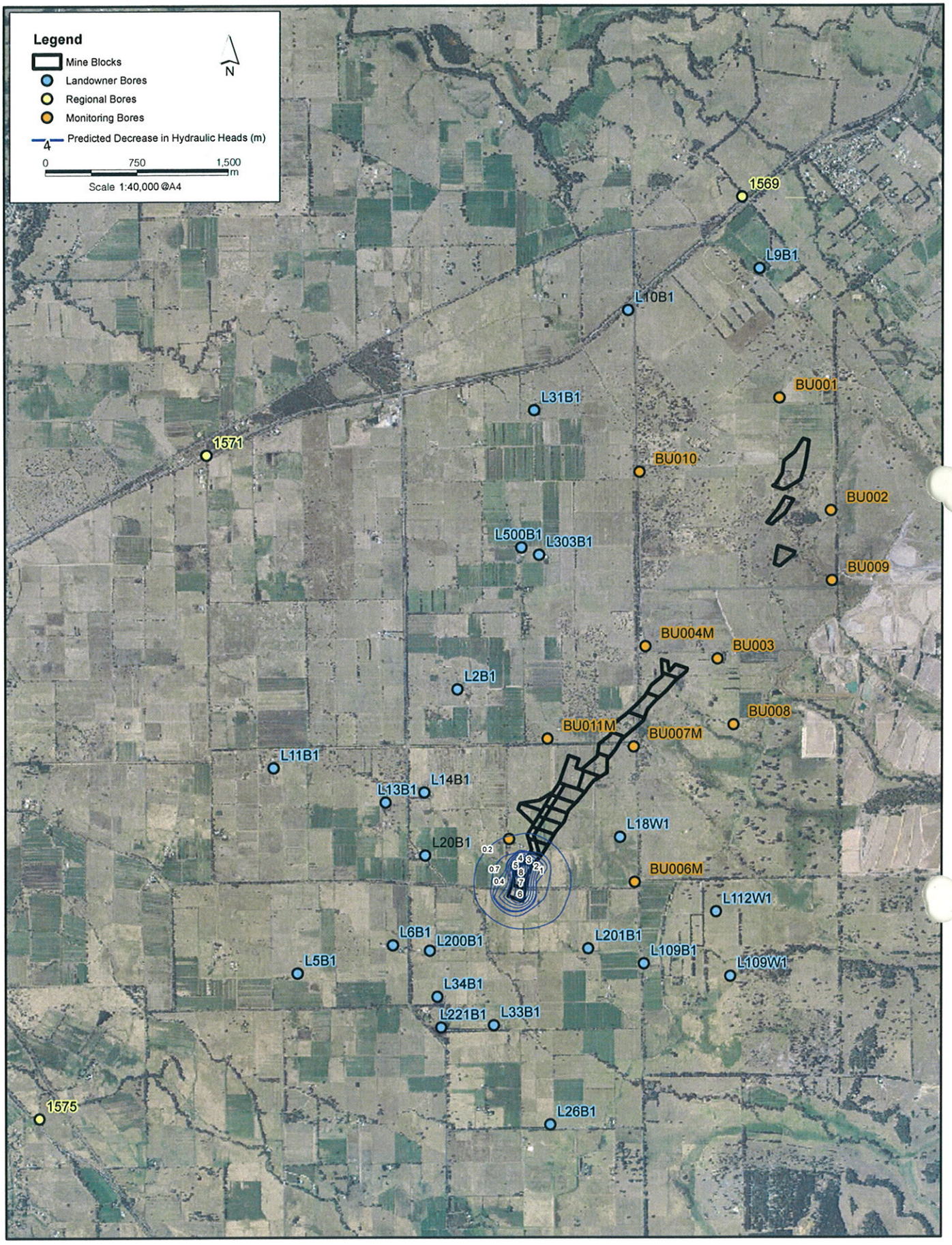
Within eight months after the cessation of mining, the hydraulic head in both formations is predicted to have recovered to within 1 m of pre-mining levels across the site.

Modelled drawdowns in the superficial aquifer and Leederville aquifer are shown in Figure 7 to Figure 16 (PB, 2007).

4.2. Adjacent Water Users

A bore census has been conducted which noted 22 landowner bores in the vicinity of the Burekup site. Information for these bores was limited with bore construction and groundwater level data generally unavailable. The groundwater assessment assumes that they are all superficial bores. Of the 22 bores, seven are predicted to experience changes in hydraulic head of greater than 0.5 m. One bore is expected to experience lowering of hydraulic head of greater than 1 m (~1.3 m). This bore is located approximately 450 m from the mine pit. The impact on landowner water supplies will depend on the depth of the bore, the depth of water within the bore prior to mining and the pump setting within the bore.

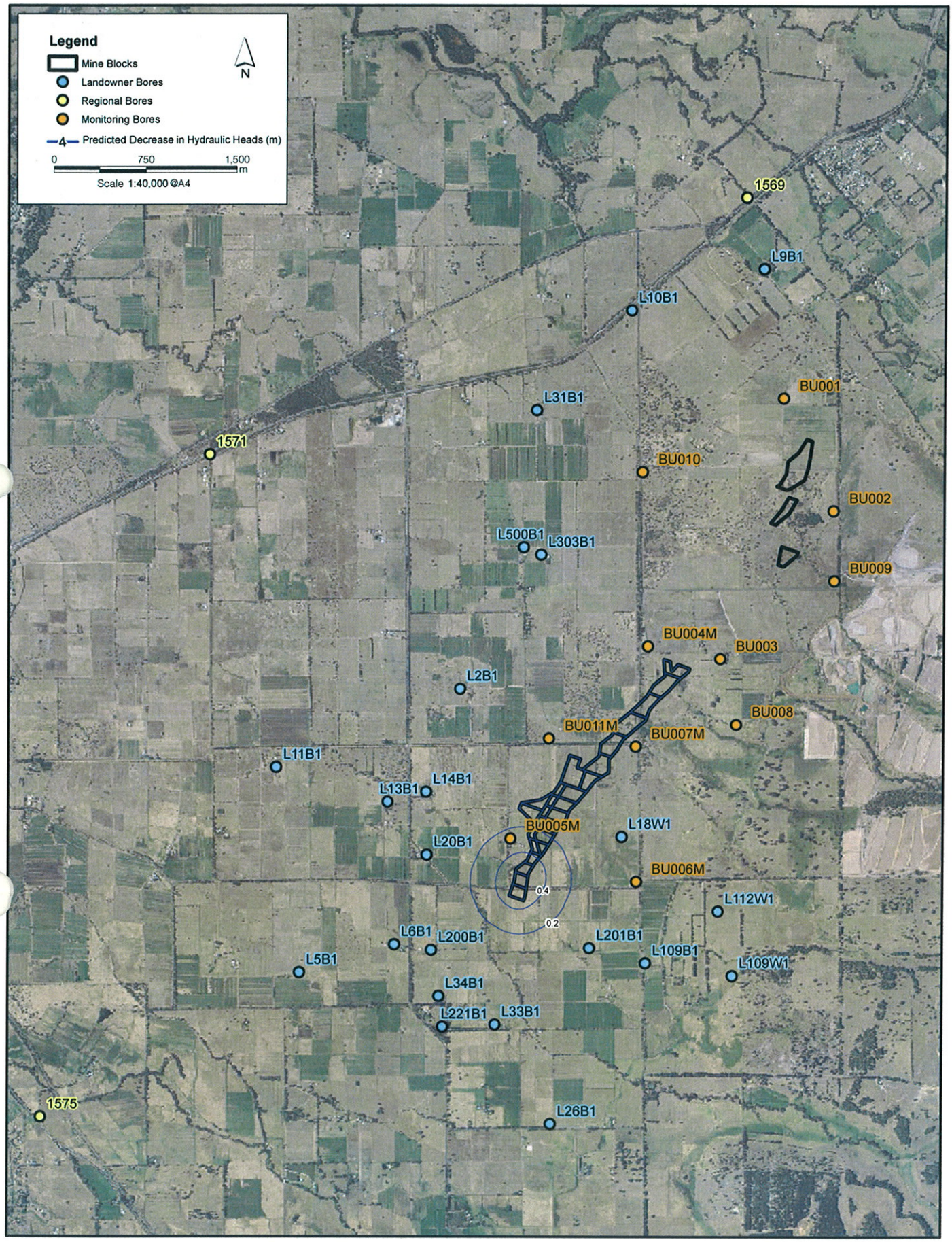
The predicted lowering of hydraulic head will be presented to each landowner.



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 7

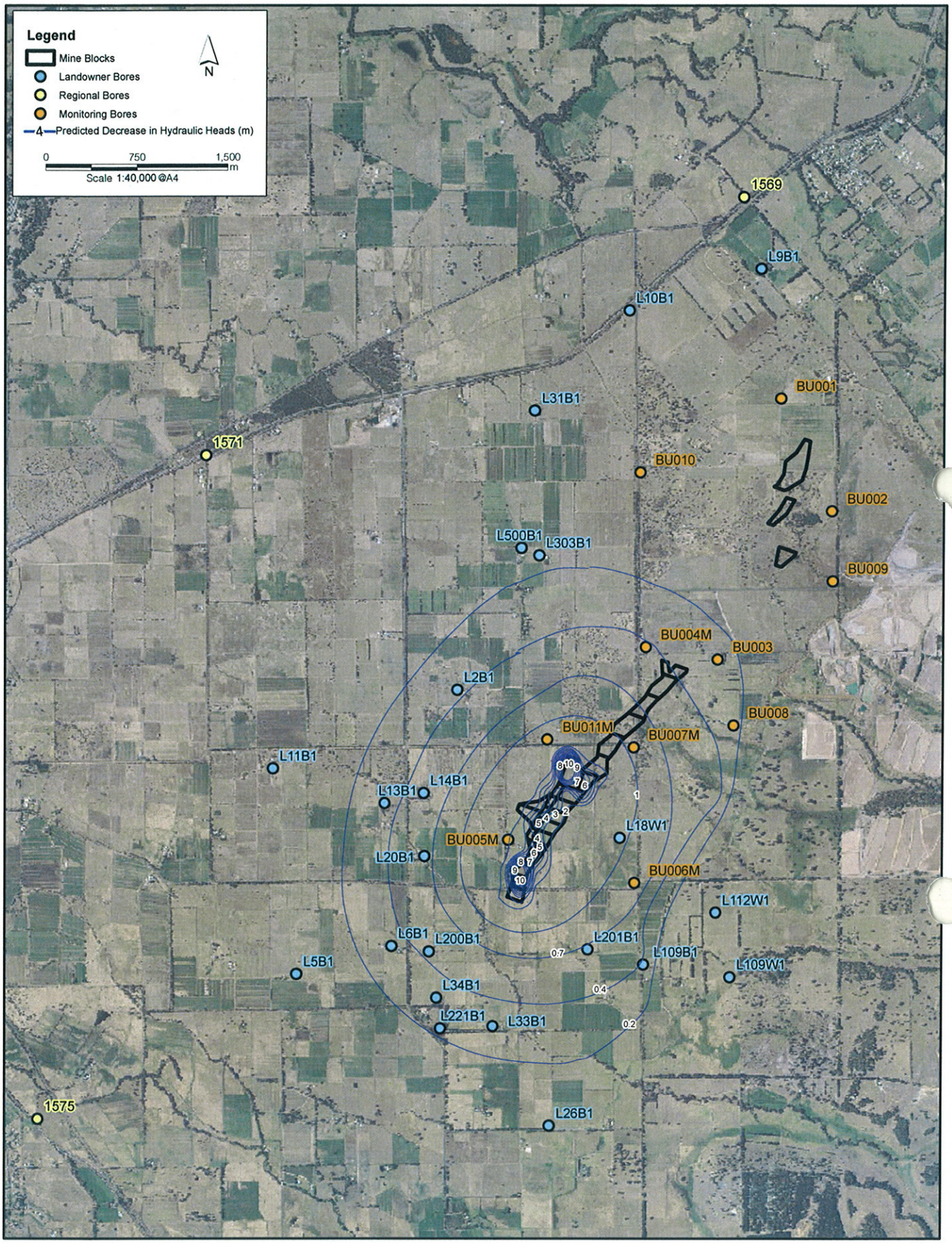
Predicted lowering of hydraulic heads: Guildford Formation - October 2008



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 8

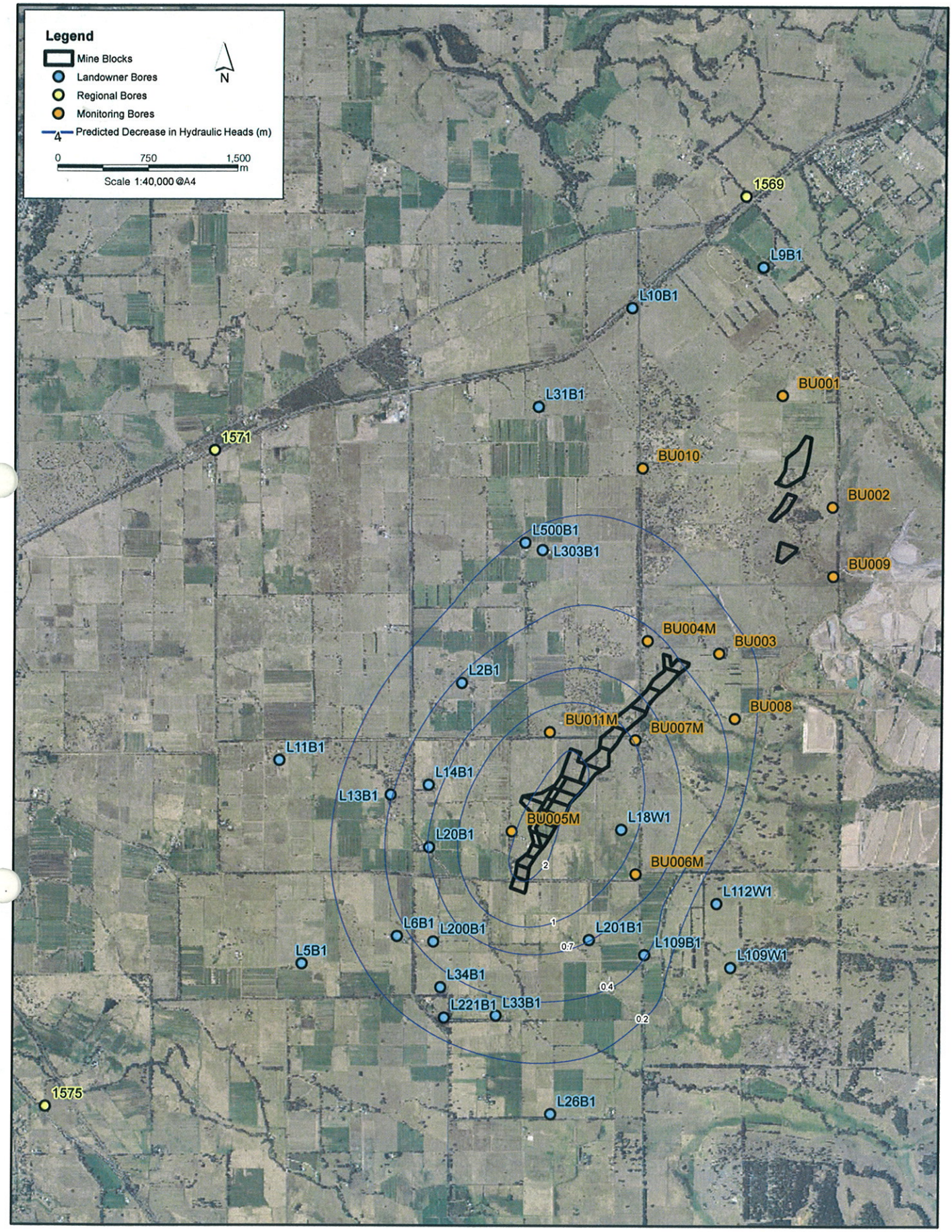
Predicted lowering of hydraulic heads: Leederville Formation - October 2008



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 9

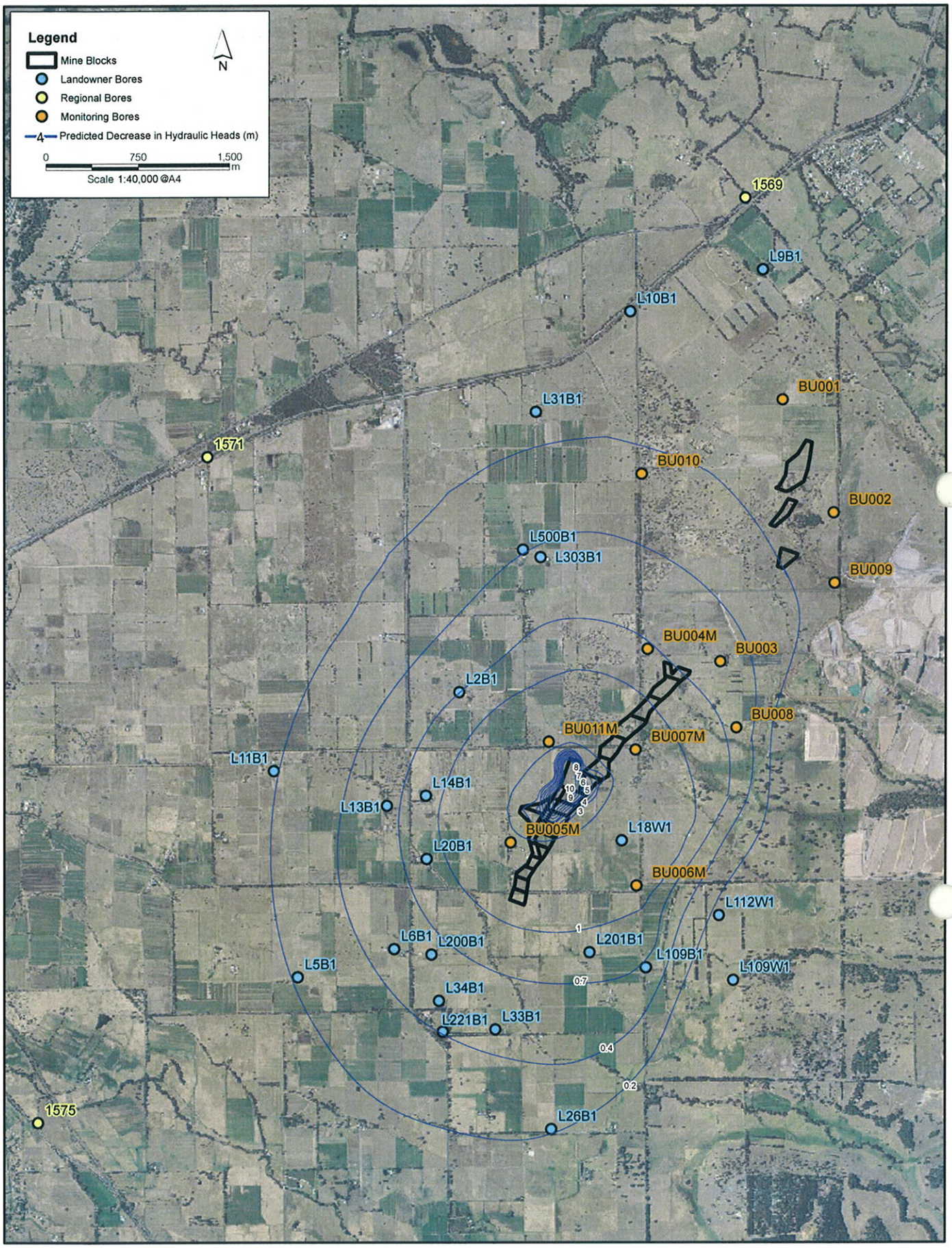
Predicted lowering of hydraulic heads: Guildford Formation - April 2009



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 10

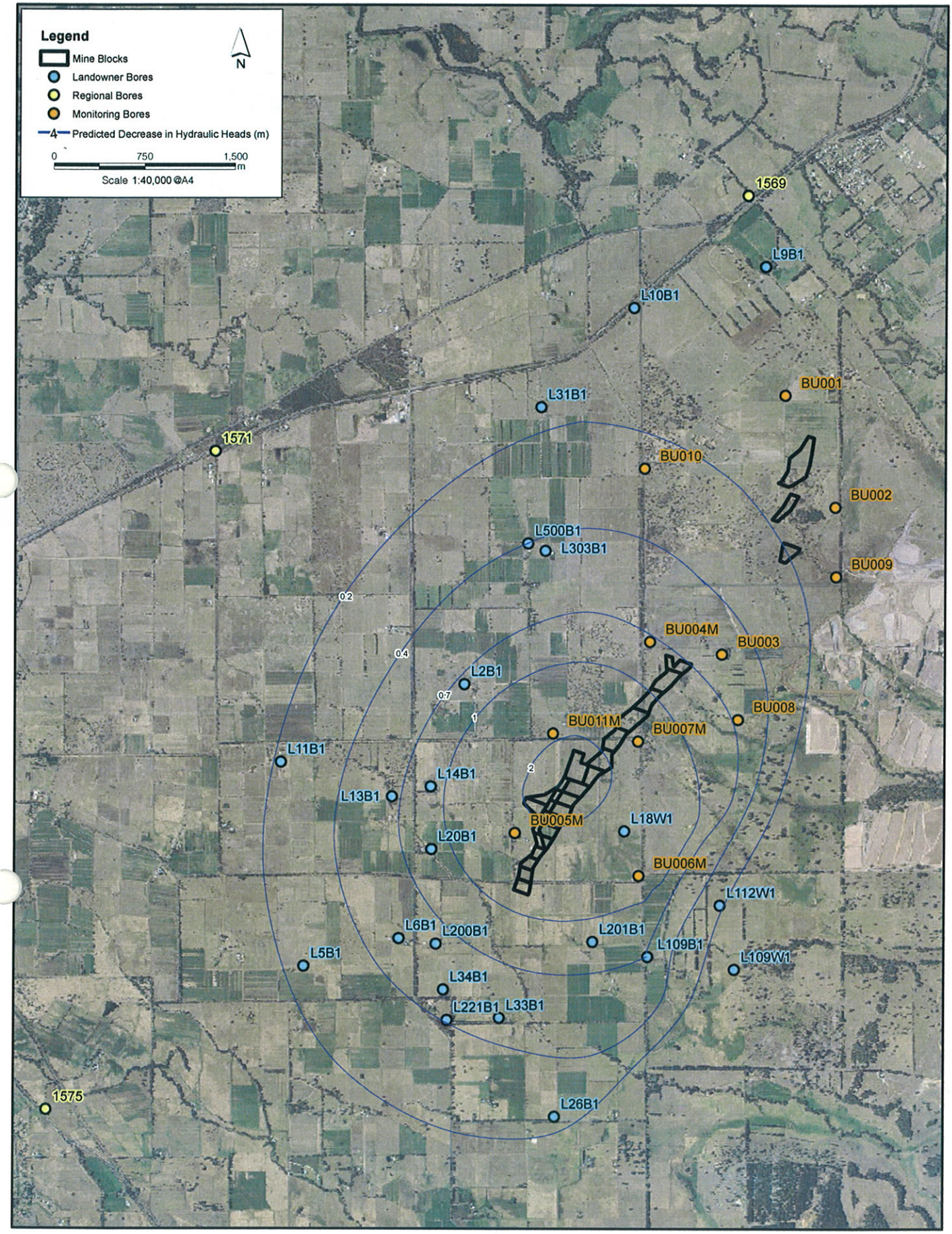
Predicted lowering of hydraulic heads: Leederville Formation - April 2009



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 11

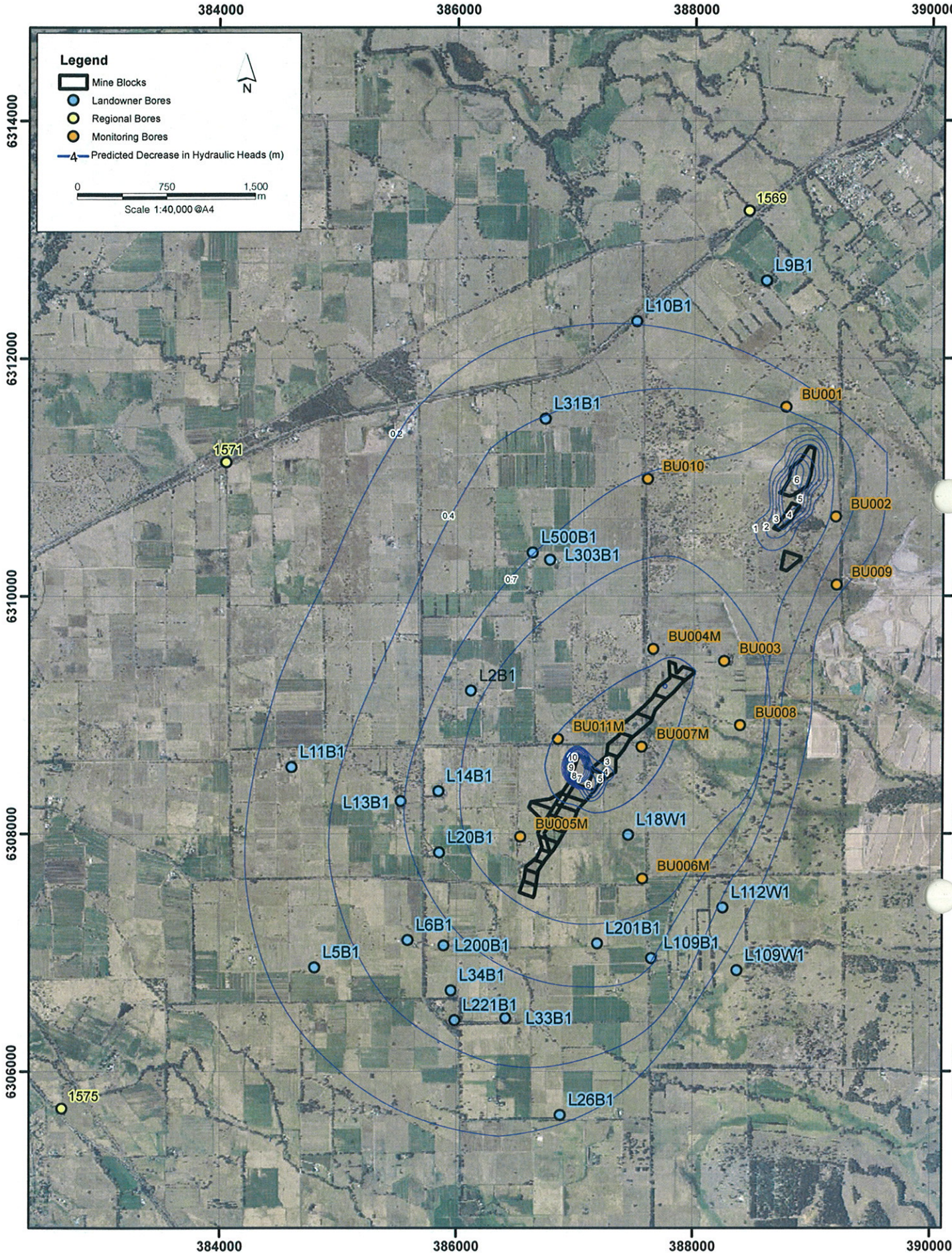
Predicted lowering of hydraulic heads: Guildford Formation - October 2009



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 12

Predicted lowering of hydraulic heads: Leederville Formation - October 2009

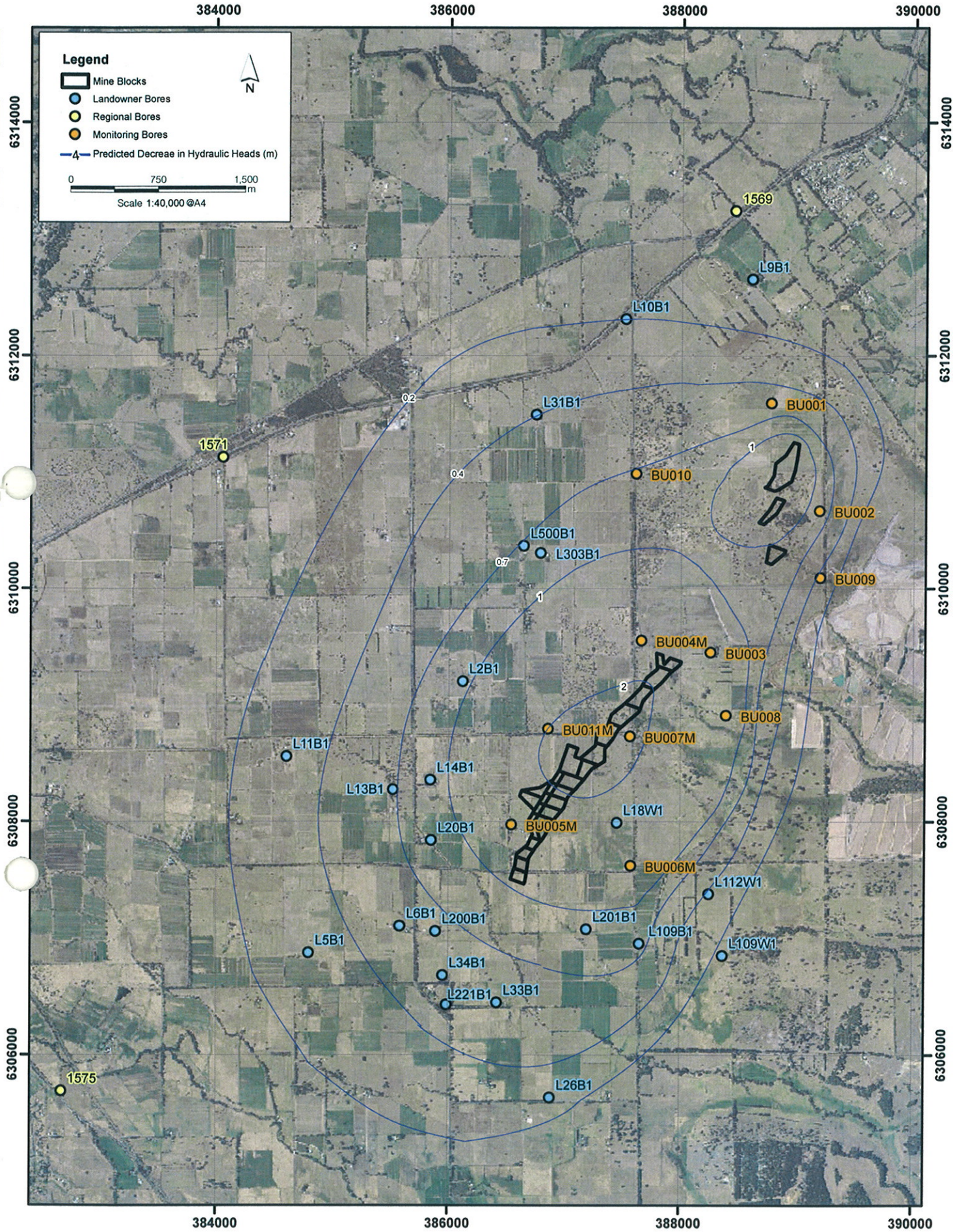


Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 13

Predicted lowering of hydraulic heads: Guildford Formation - April 2010

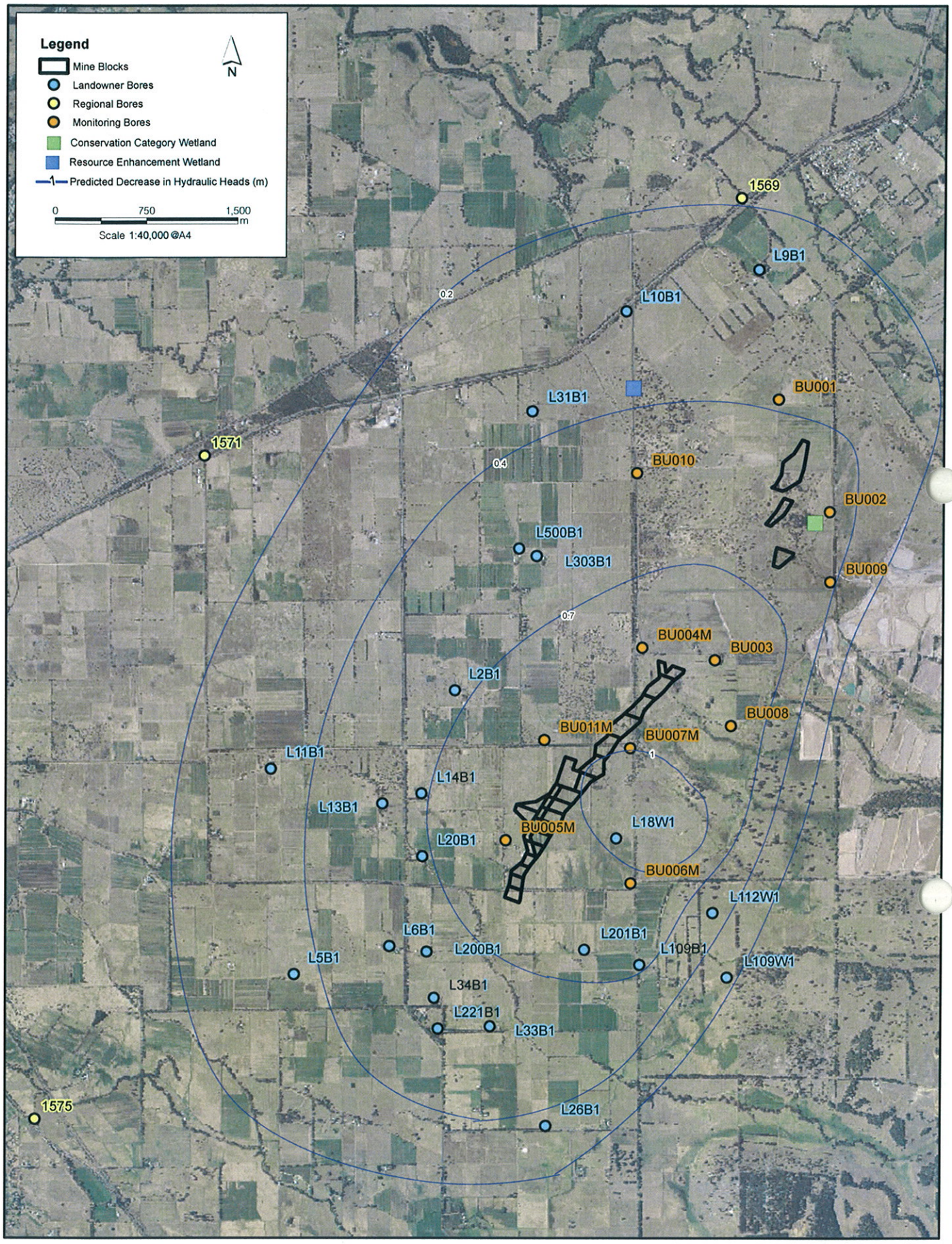
PB PARSONS BRINCKERHOFF • Email: perth@pb.com.au • DRN: CT CHK: SB • Date: 13/06/2007 • Job Reference: 2142189A



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 14

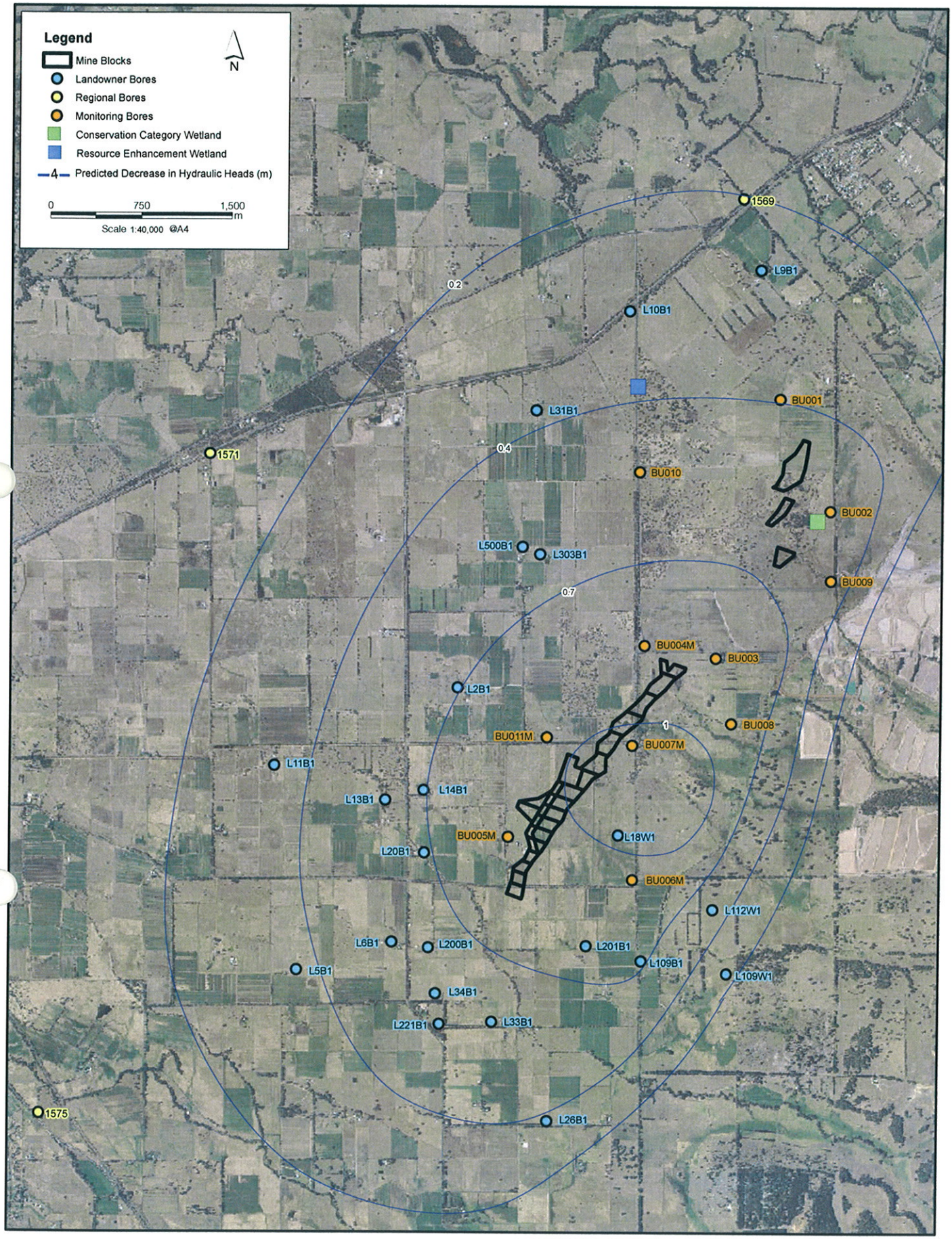
Predicted lowering of hydraulic heads: Leederville Formation - April 2010



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 15

Predicted lowering of hydraulic heads: Guildford Formation - February 2011



Iluka Resources Limited
Burekup Deposit: Modelling of Groundwater Level Impacts

FIGURE 16

Predicted lowering of hydraulic heads: Leederville Formation - January 2011

4.3. Groundwater Dependent Ecosystems

Henty Brook is located approximately 3 km from the Project and is not expected to be influenced by mining activities as drawdown in the vicinity of the Brook is predicted to be negligible (PB, 2007). Groundwater modelling predicts the piezometric head to be lowered by up to 0.8 m in the vicinity of the conservation category wetland located approximately 150 m to the east of the mine pit and up to 0.4 m in the vicinity of the resource enhancement wetland located approximately 600 m to the northwest of the mine pit. Groundwater drawdown greater than 0.2 m below the conservation category and resource enhancement category wetlands is predicted to last for less than 8 months.

Due to this predicted drawdown in the vicinity of the conservation category and resource enhancement category wetlands, further study was conducted on these locations as part of the GDE assessment (SWC 2007). No impact on either wetland or any associated vegetation is likely to occur as a result of the project.

5. OPERATING RULES

The following are included in the operating rules for the Burekup Mine:

- Based on the maximum predicted inflow rates for each month of dewatering, abstraction over a calendar year is expected to be up to 1300 ML (annual volume based on predicted minimum inflows is 600 ML; annual volume based on predicted average inflow is approximately 900 ML).
- Monthly aggregate abstraction volumes area expected to range from 21 ML (based on minimum inflow rates) to 56 ML (based on maximum inflow rates) (PB, 2007).
- Dewatering water will be preferentially used for process water supply and dust suppression, vehicle washdown and rehabilitation work.
- Abstraction will take place all year.
- Water meters will be calibrated as per the manufacturer's specifications.

6. PERFORMANCE INDICATORS/CRITERIA

Table 1: Performance Indicators/Criteria

Indicator No.	Subject	Indicator
1	Drainage Controls	All water from disturbed areas is captured and directed to the process water system
2	Water Release	Excess water to be released from site through a licensed discharge point within the site's prescribed premises licence limits
3	Water levels	Change in water levels within predicted variation
4	Water abstraction	Water abstraction within predicted volumes

7. MANAGEMENT

7.1. Conservation and resource enhancement category wetlands

The conservation category wetland is located approximately 100 m from the pit void and mining infrastructure. The resource enhancement category wetland is located over 500 m from the pit void and over 200 m from any site disturbance (Figure 17).

7.2. Drainage Controls

Rainfall and runoff within the site will be collected in the process water system for use in processing and dust suppression.

7.3. Water Discharge Control

At times when there is excess water to site requirements (eg construction, peak groundwater inflows and peak water flows during winter), water release will be required at a discharge point licensed by the Department of Environment and Conservation (DEC), with monitoring in place to ensure that the water released meets licence requirements. It is proposed to release water into the Dowdells Line Road drain, adjacent to the concentrator location. Water will be pumped to a sump adjacent to the drain, prior to release. This drain is well maintained and shown in Figure 18 and Figure 19.

Water discharge from site will be conducted in accordance with the site's prescribed premises licence. Compliance will be reported in the Annual Environmental Report.

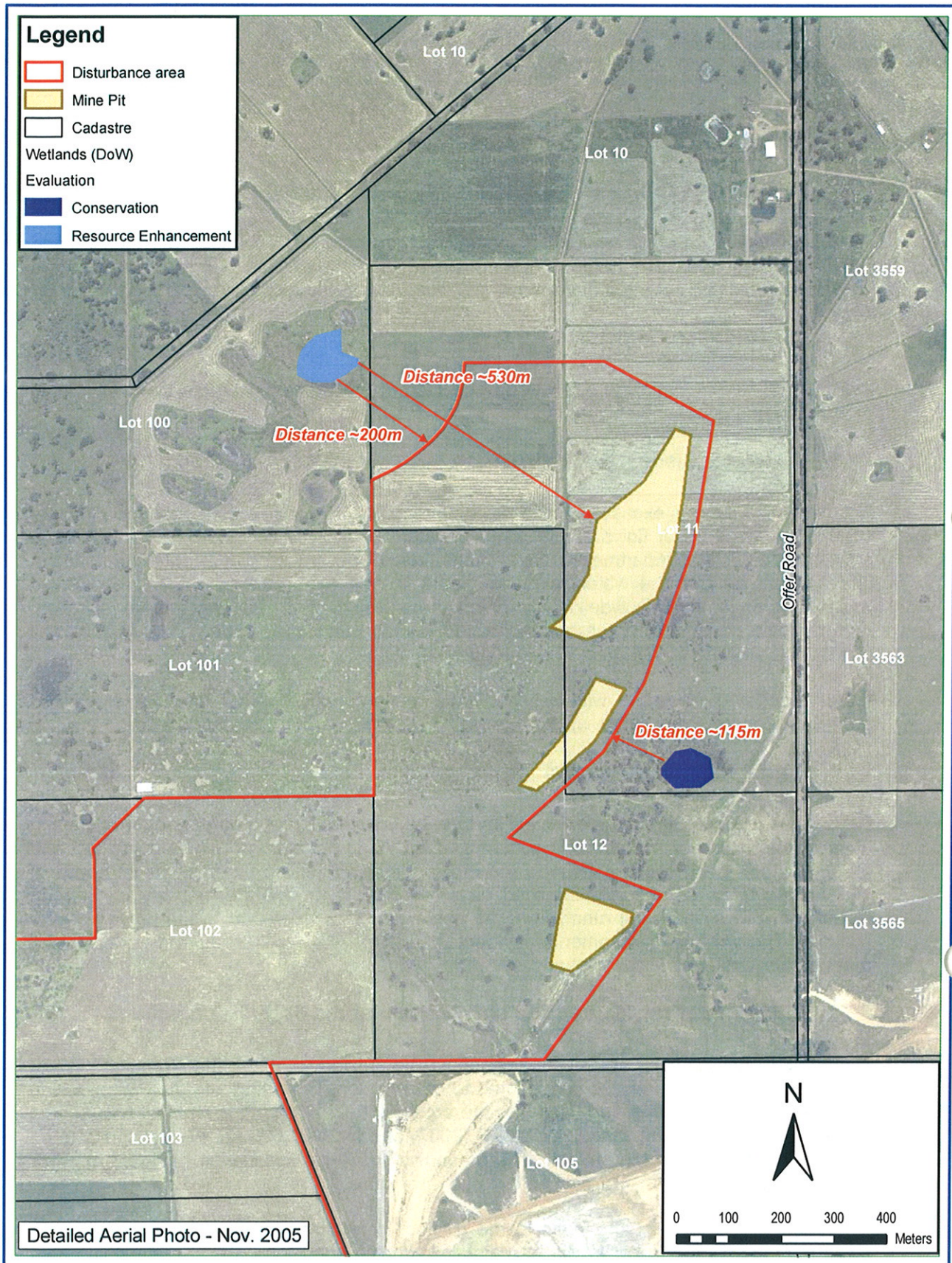
7.4. Contaminant Control

Development of the Burekup project will involve the construction of a number of facilities that have the potential for hydrocarbon contamination. All hydrocarbons will be contained and managed to prevent contamination to the environment. Refuelling facilities will comprise of self-bunded tanks on imperviously lined pads reporting to an oil/water separator. Treated water from this system and runoff from the contractor area will report to the process water system. The existing environmental incident reporting system will be utilised to report and manage any spillage of hydrocarbons.

7.5. Dewatering Abstraction and Acid Sulphate Soils Management

A superficial groundwater abstraction licence will be applied for under the *RIWI Act*. Water removed from the mine blocks is expected to be used for processing and dust suppression with a minor amount infiltrating back into the aquifer through deposition of sand tailings into the mine void. Modelling conducted by PB (2007) anticipates 1,600 ML of dewatering to be required over the life of the project. The groundwater licence application will need to cover this volume.

In areas where PASS occurs close to the pit floor, the mining method will be modified to allow management of water levels to maintain reducing conditions, whilst maintaining safe working conditions.



BUREKUP

DISTANCE TO WETLANDS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:10,000 (A4) DATE: 23 Nov. 2007 DWG No: 170436 ver.03

FIGURE: 17

Figure 18: **Dowdells Line Road drain from approximate discharge point, looking south**

Figure 19: **Dowdells Line Road drain from approximate discharge point, looking north**

7.6. Landowner Bores

It is expected that dewatering activities will have a minor (<0.5 m) to negligible impact on bores of surrounding landowners. The worst case drawdown was 1.3 m for a bore 450 m southeast of the mining blocks. In the event a landowner notes a change in the capability of their bore to deliver water which is believed to be a consequence of Iluka's operations, a review of data from the nearest Iluka monitoring bores will be conducted. If the review indicates landowner bores have been impacted by Iluka's mining activities, make up water supplies will be provided.

8. MONITORING

Iluka's planned monitoring programme is outlined in Table 2. This programme will be reviewed and updated as required.

There are currently 16 piezometers (5 pairs of deep/shallow and 6 shallow) installed at Burekup monitoring the superficial and Leederville aquifers. Two additional monitoring piezometers will be installed to the south of the site to monitor hydraulic head in the vicinity of neighbouring bores, as recommended by PB 2007).

The current piezometers were installed to characterise the hydrogeology of the site and provide information for groundwater modelling. Of these piezometers, BU003, BU004D, BU004M, BU011D and BU011M are located within the disturbance area. Whilst every effort will be made to retain these piezometers, several may be required to be removed and will subsequently be removed from the monitoring programme.

Due to the nature of the site, some piezometers are unable or unsafe to be accessed in wet conditions. When ground conditions preclude access, these piezometers will not be monitored.

Locations of groundwater monitoring bores are shown on Figure 4. Surface water monitoring sites are shown on Figure 6. The process water dam and water discharge point are shown on Figure 20.

Water samples will be collected in accordance with AS5667.1:1998 and submitted to a NATA accredited laboratory for analysis, in accordance with "Standard Methods for Examination of Water and Wastewater-APHA-AWWA-WEF".

The results of monitoring will be reviewed on the receipt of results and any anomalous results scrutinised and resampled if necessary. The full suite of data collected will be reviewed as part of annual reporting.

8.1. Duration of monitoring

The monitoring program described in Table 2 will continue until overburden backfill is complete. After that time, the monitoring programme outlined in Table 3 will be implemented. This programme will operate for one year, at which time it will be reviewed and the need for continued monitoring assessed.

Table 2: Mining Monitoring Programme

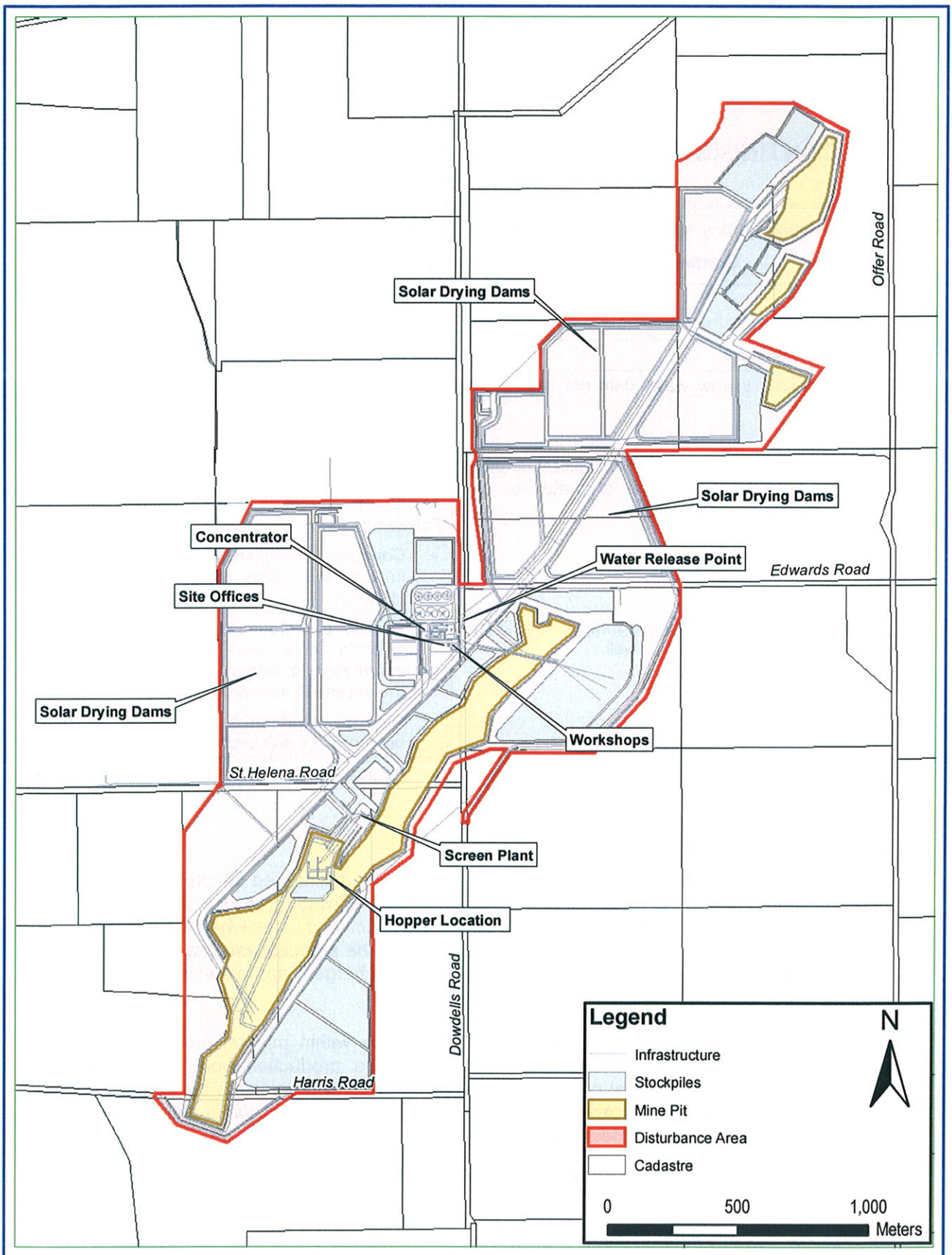
Monitoring site	Frequency	Analyte	Trigger

Monitoring site	Frequency	Analyte	Trigger
Superficial and Leederville piezometers: BU001, BU002, BU003, BU004D, BU004M, BU005D, BU005M, BU006D, BU006M BU007D, BU007M BU008, BU009, BU010, BU011D, BU011M	Monthly	SWL (m AHD)	
	Quarterly	Field pH	> 1 unit less than previous 12 months
		Field EC	+/- 20 % from baseline in bore
		Cl:SO4	Change to < 4
	Annually	NO3; Ca; Na; K; Alkalinity; Al; Cr; Cu; Fe; Mn; Mg; Ni; Zn; Cd; Se; As; Pb; Hg	
Regional piezometers: (to be installed)	Quarterly	SWL (m AHD)	
	Annually	Field pH	
		Field EC	
		Cl:SO4	
		NO3; Ca; Na; K; Alkalinity; Al; Cr; Cu; Fe; Mn; Mg; Ni; Zn; Cd; Se; As; Pb; Hg	
Burekup Process Water Dam (inlet from mine dewatering)	Weekly	Volume of water extracted from the pit (kL)	
Process Water Dam	Weekly	Field pH	> 1 unit less than previous 4 weeks
		Field EC (μScm^{-1})	1250
	Quarterly	Aluminium (mgL^{-1}) Manganese (mgL^{-1}) Iron (mgL^{-1}) Total Acidity (mgL^{-1}) Total Petroleum Hydrocarbons (mgL^{-1}) Total Suspended Solids (mgL^{-1})	> 2.5 mg/L > 1.9 mg/L > 0.2 mg/L > 30 mg/L Any detected > 60 mg/L
	Annually	Arsenic (mgL^{-1}) Calcium (mgL^{-1}) Cadmium (mgL^{-1}) Chromium (mgL^{-1}) Copper (mgL^{-1}) Lead (mgL^{-1}) Mercury (mgL^{-1}) Nickel (mgL^{-1}) Zinc (mgL^{-1})	Check for increase from previous sample
Dewatering sumps, decant water	Weekly	Field pH	> 1 unit less than previous 4 weeks
		Field EC (μScm^{-1})	1250
Water Discharge Point	Continuous	Volume (m^3)	
	Every Week (when flowing)	pH Electrical Conductivity (μScm^{-}	6.5 / 8.0 1250

Monitoring site	Frequency	Analyte	Trigger
		[1]) Total Suspended Solids (mgL^{-1})	80
	Every Month (when flowing)	Iron (mgL^{-1})	0.3
		Manganese (mgL^{-1})	1.9
		Chloride : Sulphate	Change to < 4
Upstream Surface Water sites: BUS3, BUS4, BUS5,	Every Month (when flowing)	pH Electrical Conductivity (μScm^{-1}) Total Suspended Solids (mgL^{-1}) Iron (mgL^{-1}) Manganese (mgL^{-1}) Chloride : Sulphate	6.5 / 8.0 1250 80 0.3 1.9 Change to < 4
Downstream Surface Water sites: BUS6, downstream of discharge point		pH Electrical Conductivity (μScm^{-1}) Total Suspended Solids (mgL^{-1}) Iron (mgL^{-1}) Manganese (mgL^{-1}) Chloride : Sulphate	6.5 / 8.0 1250 80 0.3 1.9 Change to < 4

Table 3: Rehabilitation Monitoring Programme

Monitoring site	Frequency	Analysis
Superficial and Leederville piezometers	Monthly	SWL (m AHD)
	Annually	pH, EC, NO3; Ca; Na; K; Alkalinity; Al; Cr; Cu; Fe; Mn; Mg; Ni; Zn; Cd; Se; As; Pb; Hg
Regional piezometers	Quarterly	SWL (m AHD)



BUREKUP

MINE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000(A4) DATE: 14 Nov. 2007 DWG No: 178372 ver.00

FIGURE: 20

9. CONTINGENCY PLANS

Where an issue is identified, contingency plans will be put in place to address the concern. These contingency situations are described in Table 4.

Table 4: Contingencies for Unplanned Events

Trigger	Contingency action
Hydrocarbon spills	• Clean up using spill kits
Water quality in raw water dam not suitable for discharge	• Water treated and/or • Water is stored on site until quality is satisfactory.
Breach of water containment facilities or other release causing discharge of water to the environment	Initial response • Monitor discharge quality Follow-up • Conduct investigation to determine the impact, and devise appropriate remediation strategy
Landowner concern regarding impaired ability to extract water from a bore or well.	• Review the groundwater drawdown in the affected area and any other relevant information to determine if Iluka has caused the decline in bore productivity • Devise appropriate response following outcome of the drawdown review
Mining disturbance of PASS	• Backfill in area to be a priority

10. WATER USE EFFICIENCY

Annually it is estimated 200 ML of excess water may be discharged off site. This discharge is anticipated due to the large variation in volumes of pit dewater predicted over the course of the mine. There will be times when there is a water deficit and times when there is a surplus. As much water as possible will be held on site within the process water system, in order to both minimise the volume of water required to be discharged, and minimise the volume of water required to be drawn from the production bore.

The recycling and management mechanisms in place within mineral processing facilities further reduce the requirement for drawing from the production bore. Processing is anticipated to require a total of 13,000 ML water. However, approximately 85% of the total site water requirement is expected to be sourced from recycled water sources including water decanted from clay and sand tails.

Some of the practices which Iluka has in place at this site to increase water use efficiency are:

- use dewatered water in preference to the Harvey Water Irrigation System;
- daily monitoring of dewatering pumps and pipeline; control of slimes dam return water and optimisation of water return on site included in outstations operator's role;
- water balance completed at site commencement (Appendix 3);

- water balance completed at start of summer to identify losses and minimise consumption of water from external sources; and
- review of water balance as part of change management strategies.

11. ADMINISTRATIVE REQUIREMENTS AND REPORTING

11.1. Contact person

The Burekup Project Manager is responsible for the implementation of this plan until such time as the site becomes operational. He/she can be contacted via the following details:

Project Manager, Burekup Mineral Sands Project
Iluka Resources Limited
GPO Box U1988
Perth WA 6845
(08) 9360 4700

11.2. Annual monitoring review

This version of the Operating Strategy will be current upon approval by DoW. It will form part of the conditions of the licence to dewater once issued.

An annual aquifer monitoring review is to be submitted to the DoW before 31 March of each year, summarising changes in operations, particulars and interpretation of the previous year's monitoring data to enable a regional assessment of the impacts of abstraction within the framework of groundwater management areas, sub-areas and groundwater flow systems. The reporting period (water year) is proposed to be between 1st January and 31st December.

The assessment should comment on the effects of abstraction on the local and regional resources of the superficial formations and other groundwater users. The assessments shall also investigate drawdown within the Leederville Formation which underlies the superficial formations. The assessment must include:

- Local monitoring records from piezometers;
- Observed local and regional drawdown impacts;
- Evaluation of effective aquifer parameters based on observed drawdowns;
- Relevant data on other licensed users of the superficial formation groundwater resource;
- Review of local and regional performance of the aquifer, including areas downstream of the project area;
- Comparisons between observed and predicted abstraction volumes and drawdown;
- Long-term predictions of local and regional drawdown impacts on other users and the flow system;
- A review of this plan; and
- Any breaches of GWL conditions;

The assessment shall be prepared in accordance with DoW publication *Guidelines for Hydrogeology Reports* and *Statewide Policy No. 10, Use of Operating Strategies, in the Water Licensing Process, May 2004.*

11.3. AER

Environmental compliance reports will be submitted to the DEC annually, as an appendix to the Annual Environment Report (AER). The compliance report will be based around the items in the key management actions table and will provide evidence of compliance with the management plan, in the form of relevant monitoring data and other management records.

11.4. Incremental reporting

Should a breach of this plan be identified, the DoW and/or DEC will be notified as required.

12. REVIEW AND REVISE

This plan will be reviewed to assess its suitability, adequacy and effectiveness in meeting the set objectives annually or more frequently as deemed necessary by Iluka. Where necessary, the plan will be revised and revisions will be submitted to the DoW.

13. KEY MANAGEMENT ACTIONS TABLE

Table 5: Key Management Actions

Key Management Actions	Evidence of demonstration
Water from disturbance areas directed to process water system	Drainage system in place
Hydrocarbons contained and managed to prevent contamination	Appropriate bunding installed
Excess water released from the nominated discharge site	Water quantity monitoring
Surface water monitoring conducted	Monitoring data
Environmental incidents reported	Incident reports
Pit dewatering water to be used in preference over other sources	Records of water use and discharge
Data reviewed if landowner concern raised	Record of review
After 6 months of operation the groundwater model is to be verified	Records of model verification
Superficial and Leederville aquifer piezometers to be monitored regularly	Monitoring data
Abstraction volumes, operating hours and cumulative abstraction from in-pit sumps to be monitored	Monitoring data

14. SUMMARY OF LICENSEE'S COMMITMENTS

In conducting its dewatering activities, the licensee makes the following commitments:

- Dewatering will be conducted by means of sump pumps, directing watering into the process water dam or other holding dams
- Dewatering will be conducted up to 1,300 ML per annum.
- Excess water that cannot be contained on site will be released from a location licensed by the DEC
- Pit water abstraction will be used preferentially for processing water supply and other site functions such as dust suppression
- The monitoring program identified in section 8 will be implemented
- An annual monitoring review will be reported to the DoW before 31 March of each year for the reporting period 1 January to 31 December.

15. REFERENCES

ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Parsons Brinckerhoff (2007) *Burekup Deposit: Modelling of Groundwater Level Impacts.* Report to Iluka Resources Ltd.

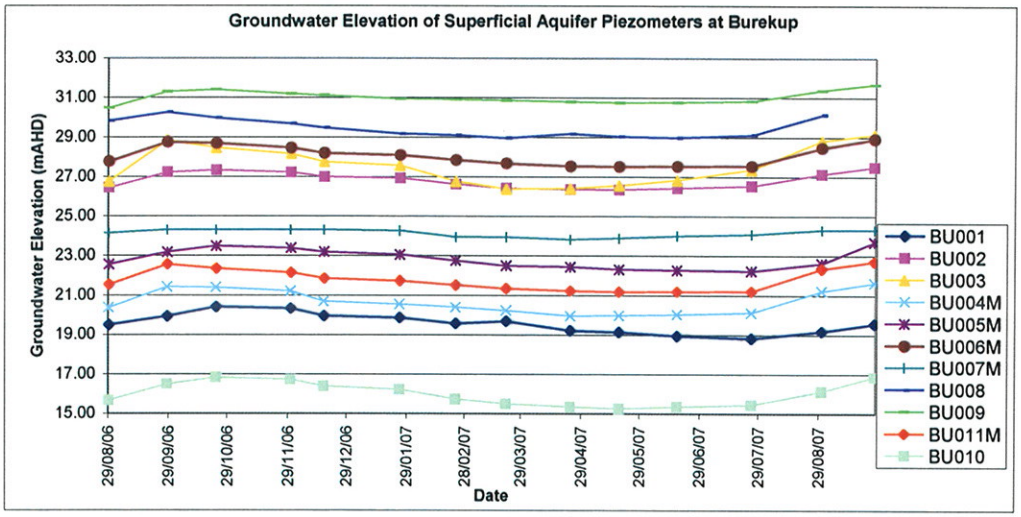
Soil Water Consultants (2007) *Groundwater Dependent Ecosystem Assessment for the Proposed Burekup Minesite.* Report prepared for Iluka Resources Limited.

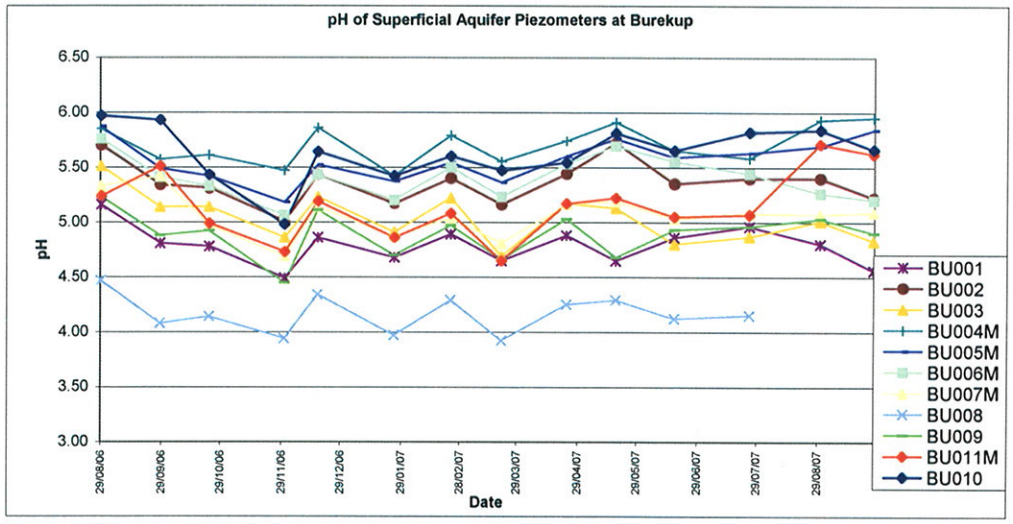
Wetland Research and Management (2006) *Burekup Project Baseline Aquatic Biology and Water Quality Study.* Report prepared for Iluka Resources Limited.

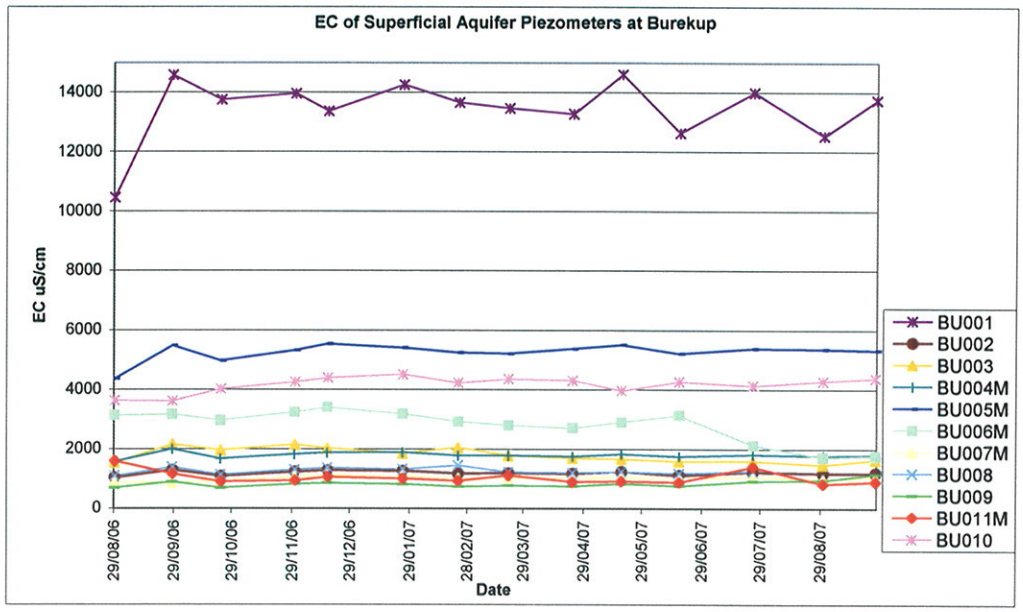
16. DOCUMENT CONTROL

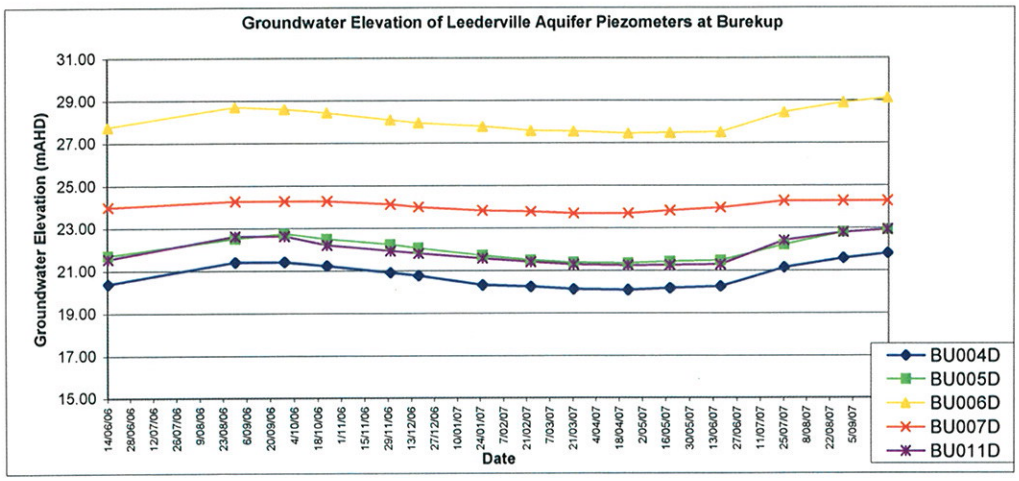
Revision	Reviews/Changes	Create Date
A	First Draft	10 October 2007
B	PMc Revision	26 October 2007
C	SJ Review	6 November 2007
D	Internal Review	14 November 2007
E	Comments incorporated	21 November 2007

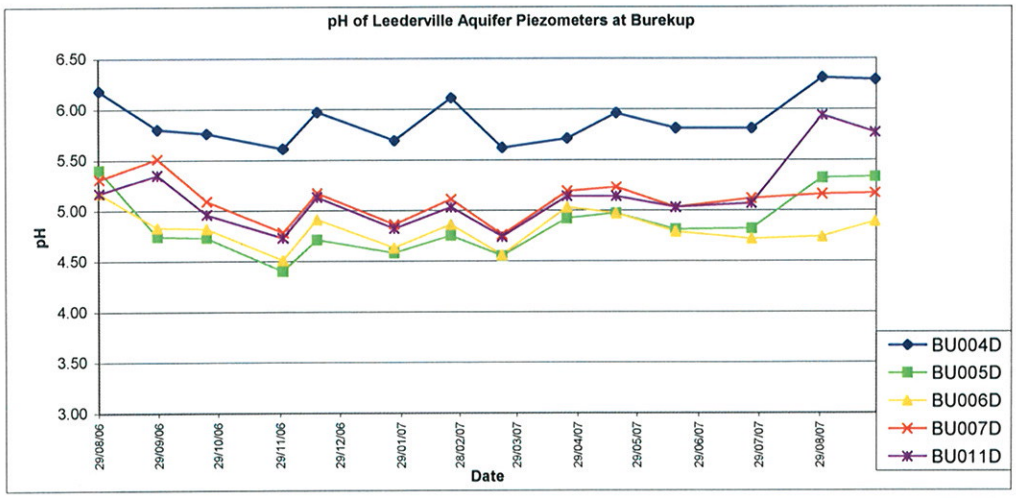
Appendix 1: Groundwater levels, pH and EC Graphs and Data to September 2007

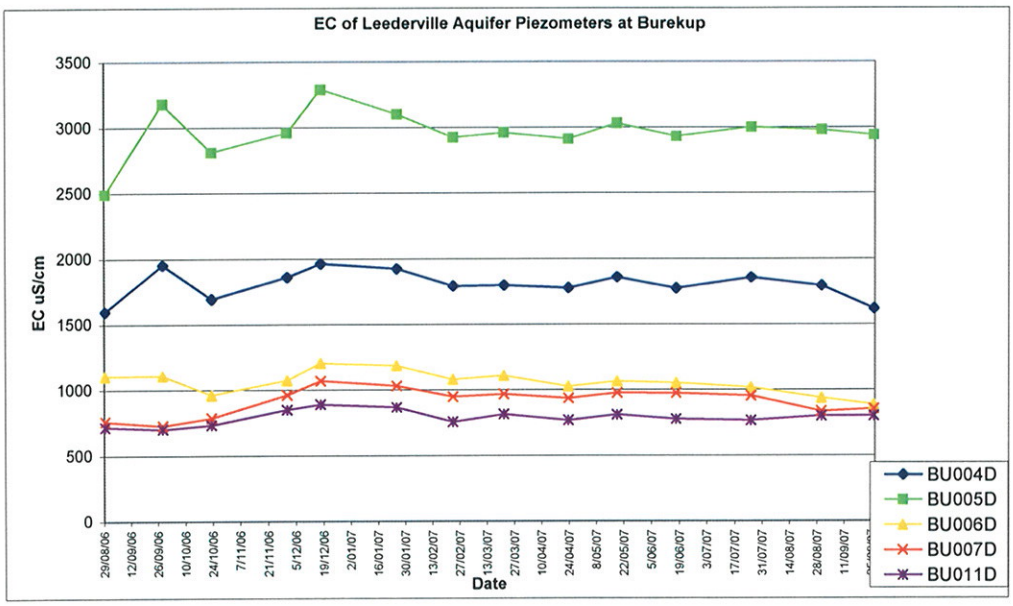

Groundwater Elevation of Superficial Aquifer Piezometers at Burekup
Groundwater Elevation (mAHD)
33.00
31.00
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
29/08/06
29/09/06
29/10/06
29/11/06
29/12/06
29/01/07
28/02/07
29/03/07
29/04/07
29/05/07
29/06/07
29/07/07
29/08/07
Date
BU001
BU002
BU003
BU004M
BU005M
BU006M
BU007M
BU008
BU009
BU011M
BU010


pH of Superficial Aquifer Piezometers at Burekup
pH
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
29/08/06
29/09/06
29/10/06
29/11/06
29/12/06
29/01/07
28/02/07
29/03/07
29/04/07
29/05/07
29/06/07
29/07/07
29/08/07
Date
BU001
BU002
BU003
BU004M
BU005M
BU006M
BU007M
BU008
BU009
BU011M
BU010


EC of Superficial Aquifer Piezometers at Burekup
EC uS/cm
14000
12000
10000
8000
6000
4000
2000
0
29/08/06
29/09/06
29/10/06
29/11/06
29/12/06
29/01/07
28/02/07
29/03/07
29/04/07
29/05/07
29/06/07
29/07/07
29/08/07
Date
BU001
BU002
BU003
BU004M
BU005M
BU006M
BU007M
BU008
BU009
BU011M
BU010


Groundwater Elevation of Leederville Aquifer Piezometers at Burekup
Groundwater Elevation (mAHD)
31.00
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
Date
BU004D
BU005D
BU006D
BU007D
BU011D


pH of Leederville Aquifer Piezometers at Burekup
pH
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
Date
BU004D
BU005D
BU006D
BU007D
BU011D


EC of Leederville Aquifer Piezometers at Burekup
EC uS/cm
3500
3000
2500
2000
1500
1000
500
0
Date
BU004D
BU005D
BU006D
BU007D
BU011D

Date	Site	Aquifer	Temp	pH	EC	Depth to Water	Groundwater Elevation
			oC		uS/cm	m	mAHD
14-Jun-06	BU001	Superficial				5.60	19.49
30-Aug-06	BU001	Superficial	19.2	5.16	10460	5.16	19.93
28-Sep-06	BU001	Superficial	17.2	4.81	14580	4.69	20.40
23-Oct-06	BU001	Superficial	17.1	4.78	13750	4.76	20.33
30-Nov-06	BU001	Superficial	17.3	4.49	13960	5.14	19.95
17-Dec-06	BU001	Superficial	18.2	4.86	13360	5.23	19.86
25-Jan-07	BU001	Superficial	18.2	4.68	14250	5.52	19.57
23-Feb-07	BU001	Superficial	17.9	4.89	13650	5.41	19.68
21-Mar-07	BU001	Superficial	18.1	4.65	13460	5.88	19.21
23-Apr-07	BU001	Superficial	19.3	4.88	13269	5.96	19.13
18-May-07	BU001	Superficial	18.9	4.65	14600	6.15	18.94
17-Jun-07	BU001	Superficial	19.3	4.86	12630	6.27	18.82
25-Jul-07	BU001	Superficial	19.1	4.96	13990	5.92	19.17
30-Aug-07	BU001	Superficial	18.1	4.80	12530	5.54	19.55
26-Sep-07	BU001	Superficial	18.7	4.56	13730	4.34	20.75
14-Jun-06	BU002	Superficial				1.45	26.46
30-Aug-06	BU002	Superficial	20.2	5.70	1036	0.67	27.24
28-Sep-06	BU002	Superficial	17.8	5.34	1289	0.57	27.34
23-Oct-06	BU002	Superficial	17.9	5.31	1083	0.68	27.23
30-Nov-06	BU002	Superficial	17.9	5.01	1232	0.91	27.00
17-Dec-06	BU002	Superficial	19.7	5.43	1276	0.97	26.94
25-Jan-07	BU002	Superficial	19.1	5.17	1259	1.28	26.63
23-Feb-07	BU002	Superficial	18.3	5.40	1172	1.48	26.43
21-Mar-07	BU002	Superficial	19.1	5.16	1183	1.54	26.37
23-Apr-07	BU002	Superficial	21.5	5.44	1164	1.56	26.35
18-May-07	BU002	Superficial	20.4	5.72	1229	1.47	26.44
17-Jun-07	BU002	Superficial	20.2	5.35	1110	1.36	26.55
25-Jul-07	BU002	Superficial	20.4	5.40	1230	0.76	27.15
30-Aug-07	BU002	Superficial	20.3	5.40	1181	0.41	27.50
26-Sep-07	BU002	Superficial	18.0	5.22	1185	0.29	27.62
14-Jun-06	BU003	Superficial				2.98	26.77
29-Aug-06	BU003	Superficial	18.6	5.51	1533	0.91	28.84
28-Sep-06	BU003	Superficial	15.6	5.14	2158	1.29	28.46
23-Oct-06	BU003	Superficial	16.0	5.14	1956	1.59	28.16
30-Nov-06	BU003	Superficial	16.5	4.86	2138	1.99	27.76
17-Dec-06	BU003	Superficial	18.2	5.23	2023	2.18	27.57
25-Jan-07	BU003	Superficial	17.5	4.91	1848	2.98	26.77
23-Feb-07	BU003	Superficial	16.5	5.22	2044	3.37	26.38
21-Mar-07	BU003	Superficial	18.6	4.69	1775	3.34	26.41
23-Apr-07	BU003	Superficial	19.7	5.17	1696	3.18	26.57
18-May-07	BU003	Superficial	18.7	5.13	1658	2.92	26.83
17-Jun-07	BU003	Superficial	18.0	4.80	1585	2.38	27.37
25-Jul-07	BU003	Superficial	15.6	4.87	1591	0.93	28.82
30-Aug-07	BU003	Superficial	15.4	5.01	1469	0.61	29.14
26-Sep-07	BU003	Superficial	16.4	4.83	1643	0.54	29.21

Date	Site	Aquifer	Temp	pH	EC	Depth to Water	Groundwater Elevation
			oC		uS/cm	m	mAHD
14-Jun-06	BU004D	Leederville				2.12	20.38
29-Aug-06	BU004D	Leederville	20.6	6.18	1595	1.10	21.40
28-Sep-06	BU004D	Leederville	17.5	5.80	1951	1.09	21.41
23-Oct-06	BU004D	Leederville	18.0	5.76	1691	1.27	21.23
30-Nov-06	BU004D	Leederville	18.2	5.61	1858	1.59	20.91
17-Dec-06	BU004D	Leederville	19.5	5.97	1962	1.74	20.76
25-Jan-07	BU004D	Leederville	18.9	5.69	1922	2.19	20.31
23-Feb-07	BU004D	Leederville	19.4	6.11	1790	2.26	20.24
21-Mar-07	BU004D	Leederville	18.7	5.62	1795	2.38	20.12
23-Apr-07	BU004D	Leederville	21.2	5.71	1775	2.42	20.08
18-May-07	BU004D	Leederville	20.4	5.96	1857	2.33	20.17
17-Jun-07	BU004D	Leederville	19.6	5.81	1772	2.25	20.25
25-Jul-07	BU004D	Leederville	19.8	5.81	1855	1.36	21.14
30-Aug-07	BU004D	Leederville	17.5	6.31	1792	0.93	21.57
26-Sep-07	BU004D	Leederville	18.2	6.29	1617	0.70	21.80
14-Jun-06	BU004M	Superficial				2.10	20.37
29-Aug-06	BU004M	Superficial	20.5	5.85	1565	1.05	21.42
28-Sep-06	BU004M	Superficial	17.9	5.57	1997	1.08	21.39
23-Oct-06	BU004M	Superficial	18.0	5.61	1666	1.27	21.20
30-Nov-06	BU004M	Superficial	18.3	5.47	1818	1.79	20.68
17-Dec-06	BU004M	Superficial	19.9	5.86	1873	1.93	20.54
25-Jan-07	BU004M	Superficial	19.3	5.42	1884	2.08	20.39
23-Feb-07	BU004M	Superficial	19.2	5.79	1775	2.25	20.22
21-Mar-07	BU004M	Superficial	18.5	5.55	1775	2.52	19.95
23-Apr-07	BU004M	Superficial	21.0	5.74	1745	2.50	19.97
18-May-07	BU004M	Superficial	20.3	5.91	1827	2.45	20.02
17-Jun-07	BU004M	Superficial	20.1	5.65	1746	2.36	20.11
25-Jul-07	BU004M	Superficial	19.7	5.58	1808	1.26	21.21
30-Aug-07	BU004M	Superficial	16.9	5.93	1761	0.86	21.61
26-Sep-07	BU004M	Superficial	17.7	5.95	1784	0.70	21.77
14-Jun-06	BU005D	Leederville				4.54	21.70
29-Aug-06	BU005D	Leederville	20.2	5.40	2490	3.74	22.50
28-Sep-06	BU005D	Leederville	16.1	4.74	3180	3.51	22.73
23-Oct-06	BU005D	Leederville	17.0	4.73	2810	3.76	22.48
30-Nov-06	BU005D	Leederville	17.9	4.40	2959	4.02	22.22
17-Dec-06	BU005D	Leederville	18.2	4.71	3290	4.19	22.05
25-Jan-07	BU005D	Leederville	17.5	4.58	3100	4.54	21.70
23-Feb-07	BU005D	Leederville	17.4	4.75	2923	4.75	21.49
21-Mar-07	BU005D	Leederville	17.4	4.55	2960	4.87	21.37
23-Apr-07	BU005D	Leederville	19.9	4.92	2910	4.91	21.33
18-May-07	BU005D	Leederville	19.0	4.97	3030	4.83	21.41
17-Jun-07	BU005D	Leederville	19.2	4.81	2930	4.78	21.46
25-Jul-07	BU005D	Leederville	19.1	4.82	3000	4.05	22.19
30-Aug-07	BU005D	Leederville	17.8	5.32	2980	3.45	22.79
26-Sep-07	BU005D	Leederville	18.6	5.33	2939	3.33	22.91

Date	Site	Aquifer	Temp	pH	EC	Depth to Water	Groundwater Elevation
			oC		uS/cm	m	mAHD
14-Jun-06	BU005M	Superficial				3.70	22.56
29-Aug-06	BU005M	Superficial	20.0	5.87	4360	3.08	23.18
28-Sep-06	BU005M	Superficial	16.3	5.49	5480	2.78	23.48
23-Oct-06	BU005M	Superficial	16.8	5.42	4970	2.88	23.38
30-Nov-06	BU005M	Superficial	17.3	5.18	5320	3.07	23.19
17-Dec-06	BU005M	Superficial	17.8	5.52	5530	3.21	23.05
25-Jan-07	BU005M	Superficial	17.2	5.37	5400	3.51	22.75
23-Feb-07	BU005M	Superficial	17.5	5.54	5240	3.77	22.49
21-Mar-07	BU005M	Superficial	17.4	5.36	5200	3.83	22.43
23-Apr-07	BU005M	Superficial	20.2	5.60	5370	3.96	22.30
18-May-07	BU005M	Superficial	19.7	5.76	5500	3.99	22.27
17-Jun-07	BU005M	Superficial	19.4	5.59	5210	4.03	22.23
25-Jul-07	BU005M	Superficial	19.0	5.63	5380	3.64	22.62
30-Aug-07	BU005M	Superficial	17.4	5.69	5360	2.57	23.69
26-Sep-07	BU005M	Superficial	17.7	5.84	5320	1.99	24.27
14-Jun-06	BU006D	Leederville				4.86	27.76
30-Aug-06	BU006D	Leederville	19.4	5.17	1105	3.91	28.71
28-Sep-06	BU006D	Leederville	17.0	4.83	1109	4.01	28.61
23-Oct-06	BU006D	Leederville	16.8	4.82	962	4.18	28.44
30-Nov-06	BU006D	Leederville	17.4	4.51	1074	4.52	28.10
17-Dec-06	BU006D	Leederville	18.3	4.91	1204	4.66	27.96
25-Jan-07	BU006D	Leederville	17.7	4.63	1185	4.83	27.79
23-Feb-07	BU006D	Leederville	17.5	4.86	1080	5.03	27.59
21-Mar-07	BU006D	Leederville	17.1	4.56	1109	5.06	27.56
23-Apr-07	BU006D	Leederville	20.1	5.03	1026	5.16	27.46
18-May-07	BU006D	Leederville	19.3	4.97	1065	5.14	27.48
17-Jun-07	BU006D	Leederville	18.6	4.79	1053	5.11	27.51
25-Jul-07	BU006D	Leederville	19.1	4.72	1019	4.17	28.45
30-Aug-07	BU006D	Leederville	18.8	4.74	938	3.72	28.90
26-Sep-07	BU006D	Leederville	18.3	4.89	886	3.50	29.12
14-Jun-06	BU006M	Superficial				4.86	27.77
30-Aug-06	BU006M	Superficial	19.2	5.76	3130	3.88	28.75
28-Sep-06	BU006M	Superficial	16.8	5.41	3160	3.95	28.68
23-Oct-06	BU006M	Superficial	16.6	5.33	2960	4.18	28.45
30-Nov-06	BU006M	Superficial	17.3	5.06	3230	4.44	28.19
17-Dec-06	BU006M	Superficial	17.9	5.43	3400	4.55	28.08
25-Jan-07	BU006M	Superficial	17.5	5.20	3180	4.79	27.84
23-Feb-07	BU006M	Superficial	17.6	5.50	2920	4.96	27.67
21-Mar-07	BU006M	Superficial	17.4	5.23	2797	5.10	27.53
23-Apr-07	BU006M	Superficial	20.4	5.53	2700	5.11	27.52
18-May-07	BU006M	Superficial	19.4	5.69	2900	5.10	27.53
17-Jun-07	BU006M	Superficial	19.1	5.55	3130	5.08	27.55
25-Jul-07	BU006M	Superficial	19.1	5.44	2124	4.16	28.47
30-Aug-07	BU006M	Superficial	18.7	5.26	1715	3.72	28.91
26-Sep-07	BU006M	Superficial	18.5	5.20	1767	3.51	29.12

Date	Site	Aquifer	Temp	pH	EC	Depth to Water	Groundwater Elevation
			oC		uS/cm	m	mAHD
14-Jun-06	BU007D	Leederville				0.28	23.99
30-Aug-06	BU007D	Leederville	19.7	5.31	760	0.00	24.27
28-Sep-06	BU007D	Leederville	20.6	5.51	728	0.00	24.27
23-Oct-06	BU007D	Leederville	18.0	5.09	787	0.00	24.27
30-Nov-06	BU007D	Leederville	18.4	4.78	962	0.15	24.12
17-Dec-06	BU007D	Leederville	19.4	5.17	1068	0.28	23.99
25-Jan-07	BU007D	Leederville	18.2	4.86	1029	0.45	23.82
23-Feb-07	BU007D	Leederville	18.2	5.11	947	0.49	23.78
21-Mar-07	BU007D	Leederville	18.2	4.76	967	0.58	23.69
23-Apr-07	BU007D	Leederville	20.7	5.19	935	0.58	23.69
18-May-07	BU007D	Leederville	20.2	5.23	976	0.45	23.82
17-Jun-07	BU007D	Leederville	19.6	5.03	975	0.31	23.96
25-Jul-07	BU007D	Leederville	19.2	5.12	954	0.00	24.27
30-Aug-07	BU007D	Leederville	19.0	5.16	836	0.00	24.27
26-Sep-07	BU007D	Leederville	19.3	5.17	855	0.00	24.27
14-Jun-06	BU007M	Superficial				0.16	24.15
30-Aug-06	BU007M	Superficial	19.7	5.33	884	0.00	24.31
28-Sep-06	BU007M	Superficial	20.5	5.42	860	0.00	24.31
23-Oct-06	BU007M	Superficial	17.6	4.97	920	0.00	24.31
30-Nov-06	BU007M	Superficial	18.2	4.69	1058	0.00	24.31
17-Dec-06	BU007M	Superficial	19.6	5.14	1113	0.05	24.26
25-Jan-07	BU007M	Superficial	18.1	4.87	1093	0.36	23.95
23-Feb-07	BU007M	Superficial	18.2	5.04	1022	0.37	23.94
21-Mar-07	BU007M	Superficial	18.2	4.81	1039	0.49	23.82
23-Apr-07	BU007M	Superficial	20.8	5.16	1017	0.43	23.88
18-May-07	BU007M	Superficial	20.3	5.19	1041	0.30	24.01
17-Jun-07	BU007M	Superficial	20.1	5.03	1012	0.22	24.09
25-Jul-07	BU007M	Superficial	18.5	5.08	1059	0.00	24.31
30-Aug-07	BU007M	Superficial	19.9	5.07	996	0.00	24.31
26-Sep-07	BU007M	Superficial	19.3	5.09	1029	0.00	24.31
14-Jun-06	BU008	Superficial				3.75	29.83
29-Aug-06	BU008	Superficial	19.1	4.47	1089	3.31	30.27
28-Sep-06	BU008	Superficial	16.4	4.08	1384	3.61	29.97
23-Oct-06	BU008	Superficial	16.7	4.14	1133	3.90	29.68
30-Nov-06	BU008	Superficial	16.8	3.94	1297	4.11	29.47
17-Dec-06	BU008	Superficial	17.9	4.34	1368	4.41	29.17
25-Jan-07	BU008	Superficial	17.5	3.97	1315	4.49	29.09
23-Feb-07	BU008	Superficial	17.4	4.29	1446	4.62	28.96
21-Mar-07	BU008	Superficial	17.4	3.92	1218	4.41	29.17
23-Apr-07	BU008	Superficial	19.4	4.25	1197	4.55	29.03
18-May-07	BU008	Superficial	4.3	4.29	1229	4.60	28.98
17-Jun-07	BU008	Superficial	19.0	4.12	1174	4.46	29.12
25-Jul-07	BU008	Superficial	18.6	4.15	1243	3.44	30.14

Date	Site	Aquifer	Temp	pH	EC	Depth to Water	Groundwater Elevation
			oC		uS/cm	m	mAHD
14-Jun-06	BU009	Superficial				3.35	30.47
30-Aug-06	BU009	Superficial	19.6	5.23	686	2.53	31.29
28-Sep-06	BU009	Superficial	17.1	4.88	892	2.43	31.39
23-Oct-06	BU009	Superficial	17.4	4.92	687	2.64	31.18
30-Nov-06	BU009	Superficial	17.9	4.45	819	2.71	31.11
17-Dec-06	BU009	Superficial	19.0	5.11	849	2.89	30.93
25-Jan-07	BU009	Superficial	18.5	4.70	811	2.91	30.91
23-Feb-07	BU009	Superficial	18.1	4.97	737	2.96	30.86
21-Mar-07	BU009	Superficial	18.6	4.66	769	3.03	30.79
23-Apr-07	BU009	Superficial	20.8	5.03	743	3.08	30.74
18-May-07	BU009	Superficial	20.0	4.68	825	3.06	30.76
17-Jun-07	BU009	Superficial	20.0	4.93	754	2.99	30.83
25-Jul-07	BU009	Superficial	19.5	4.96	914	2.45	31.37
30-Aug-07	BU009	Superficial	20.3	5.03	945	2.16	31.66
26-Sep-07	BU009	Superficial	18.2	4.90	1154	1.94	31.88
14-Jun-06	BU010	Superficial				3.38	15.66
29-Aug-06	BU010	Superficial	21.4	5.97	3630	2.55	16.49
28-Sep-06	BU010	Superficial	21.0	5.93	3610	2.22	16.82
23-Oct-06	BU010	Superficial	17.1	5.43	4020	2.32	16.72
30-Nov-06	BU010	Superficial	17.7	4.98	4250	2.66	16.38
17-Dec-06	BU010	Superficial	20.0	5.64	4390	2.83	16.21
25-Jan-07	BU010	Superficial	19.8	5.42	4500	3.32	15.72
23-Feb-07	BU010	Superficial	18.9	5.60	4220	3.56	15.48
21-Mar-07	BU010	Superficial	18.7	5.47	4350	3.70	15.34
23-Apr-07	BU010	Superficial	22.0	5.54	4300	3.79	15.25
18-May-07	BU010	Superficial	21.3	5.81	3960	3.69	15.35
17-Jun-07	BU010	Superficial	20.5	5.65	4260	3.60	15.44
25-Jul-07	BU010	Superficial	19.4	5.82	4130	2.92	16.12
30-Aug-07	BU010	Superficial	18.1	5.84	4280	2.19	16.85
26-Sep-07	BU010	Superficial	19.1	5.66	4380	1.88	17.16
14-Jun-06	BU011D	Leederville				2.52	21.55
30-Aug-06	BU011D	Leederville	19.9	5.17	717	1.45	22.62
28-Sep-06	BU011D	Leederville	20.1	5.35	703	1.45	22.62
23-Oct-06	BU011D	Leederville	17.8	4.96	734	1.87	22.20
30-Nov-06	BU011D	Leederville	18.3	4.73	850	2.15	21.92
17-Dec-06	BU011D	Leederville	18.9	5.13	890	2.27	21.80
25-Jan-07	BU011D	Leederville	18.4	4.82	867	2.50	21.57
23-Feb-07	BU011D	Leederville	18.0	5.03	756	2.67	21.40
21-Mar-07	BU011D	Leederville	18.3	4.74	815	2.79	21.28
23-Apr-07	BU011D	Leederville	20.4	5.14	768	2.83	21.24
18-May-07	BU011D	Leederville	20.0	5.14	810	2.82	21.25
17-Jun-07	BU011D	Leederville	19.9	5.03	777	2.79	21.28
25-Jul-07	BU011D	Leederville	19.2	5.07	766	1.66	22.41
30-Aug-07	BU011D	Leederville	17.7	5.94	801	1.28	22.79
26-Sep-07	BU011D	Leederville	17.3	5.77	801	1.15	22.92

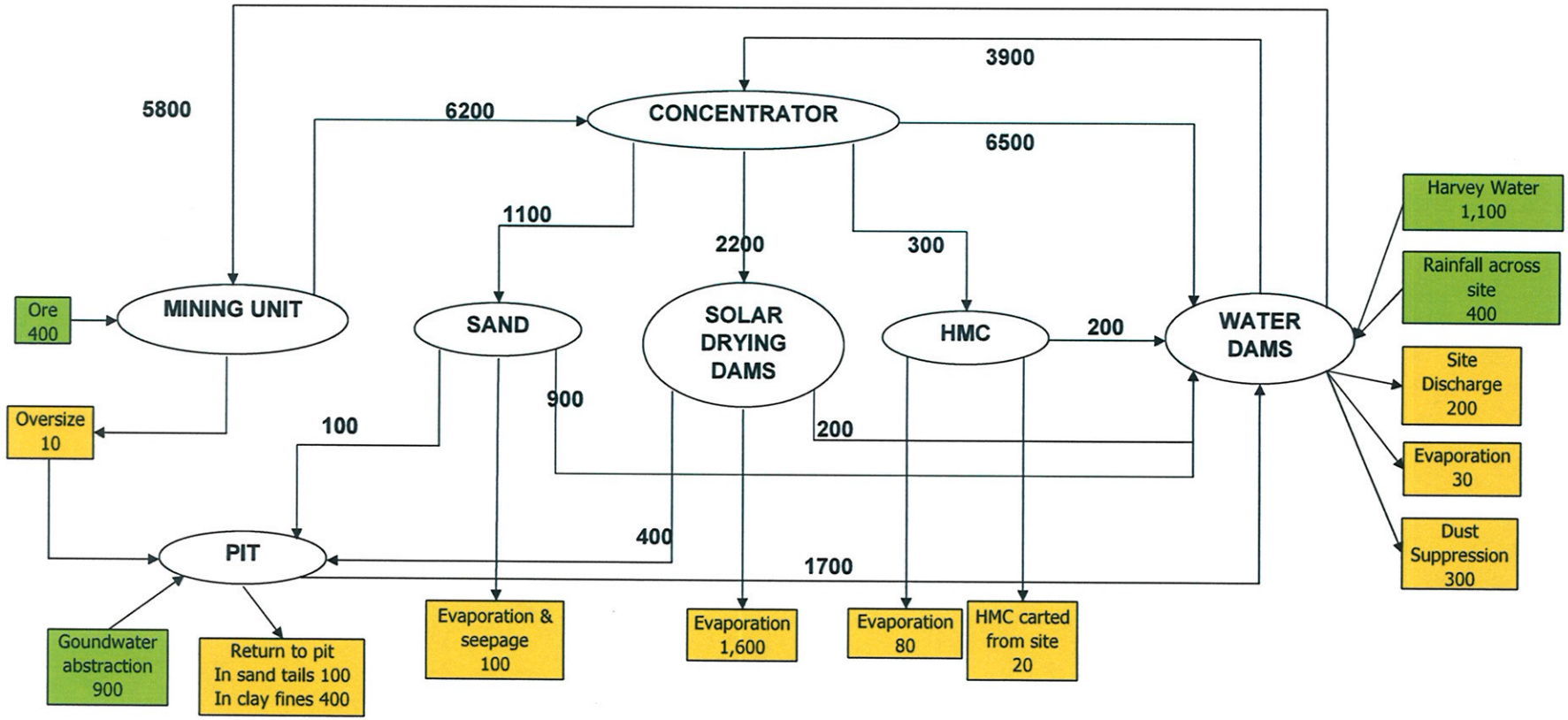
Date	Site	Aquifer	Temp	pH	EC	Depth to Water	Groundwater Elevation
			oC		uS/cm	m	mAHD
14-Jun-06	BU011M	Superficial				2.52	21.54
30-Aug-06	BU011M	Superficial	20.0	5.24	1594	1.49	22.57
28-Sep-06	BU011M	Superficial	20.2	5.51	1166	1.71	22.35
23-Oct-06	BU011M	Superficial	17.7	4.99	905	1.92	22.14
30-Nov-06	BU011M	Superficial	18.0	4.73	942	2.22	21.84
17-Dec-06	BU011M	Superficial	19.3	5.19	1059	2.34	21.72
25-Jan-07	BU011M	Superficial	18.4	4.86	1002	2.55	21.51
23-Feb-07	BU011M	Superficial	18.0	5.08	930	2.72	21.34
21-Mar-07	BU011M	Superficial	18.8	4.65	1105	2.84	21.22
23-Apr-07	BU011M	Superficial	20.5	5.17	888	2.89	21.17
18-May-07	BU011M	Superficial	19.8	5.22	914	2.87	21.19
17-Jun-07	BU011M	Superficial	19.8	5.05	882	2.86	21.20
25-Jul-07	BU011M	Superficial	19.0	5.07	1401	1.72	22.34
30-Aug-07	BU011M	Superficial	17.9	5.71	837	1.35	22.71
26-Sep-07	BU011M	Superficial	17.7	5.62	897	1.22	22.84

Appendix 2: Groundwater Quality Analyses to September 2007

Date	Monitoring	pH	EC	Cl	SO4	NO2-N	NO3-N	PO4-P	HCO3	CO3	OH	Ca	Mg	Na	K	Fe	Mn	Al
	Location	pH	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
18/12/2006	**BU001**	4.9	13400	4850	617	<0.2	<0.2	<0.2	8	<1	<1	78	409	2400	6.7	3.4	0.58	<1
21/03/2007	**BU001**	4.7	13500	4720	615	<0.2	<0.2	<0.2	12	<1	<1	80	377	2460	6.2	3.2	0.54	<1
18/06/2007	**BU001**	4.9	12600	4650		<0.2	<0.2	<0.2	14	<1	<1	69	419	2240	6.3	3.8	0.58	1
18/12/2006	**BU002**	5.4	1280	300	24.6	<0.2	<0.2	<0.2	37	<1	<1	1.3	20	168	3.7	7.9	0.04	<1
21/03/2007	**BU002**	5.2	1180	298	23.3	<0.2	<0.2	<0.2	37	<1	<1	1.2	20	172	3.5	7.9	0.04	<1
18/06/2007	**BU002**	5	1110	298	26.5	<0.2	<0.2	<0.2	35	<1	<1	1.2	19	170	3.3	7.2	0.04	1
18/12/2006	**BU003**	5.2	2020	533	58	<0.2	<0.2	<0.2	12	<1	<1	5.2	34	277	2.9	1.8	0.04	<1
21/03/2007	**BU003**	4.7	1780	496	51.1	<0.2	<0.2	<0.2	15	<1	<1	5.1	33	280	2.8	2.9	0.04	<1
18/06/2007	**BU003**	5	1590	431	37.3	<0.2	<0.2	<0.2	4.5	<1	<1	3.6	26	159	2.8	0.05	0.02	1
18/12/2006	**BU004D**	6	1960	445	54.5	<0.2	<0.2	<0.2	107	<1	<1	14	35	236	10	19.0	0.23	<1
21/03/2007	**BU004D**	5.6	1800	436	52.5	<0.2	<0.2	<0.2	111	<1	<1	15	36	249	9.7	19.0	0.22	<1
18/06/2007	**BU004D**	6	1770	437	55.3	<0.2	<0.2	<0.2	112	<1	<1	13	33	246	9.6	20	0.23	1
18/12/2006	**BU004M**	5.9	1870	441	52	<0.2	<0.2	<0.2	92	<1	<1	9.3	37	238	9.2	13.0	0.21	<1
21/03/2007	**BU004M**	5.6	1780	445	51.8	<0.2	<0.2	<0.2	86	<1	<1	8.9	37	256	8.3	13.0	0.19	<1
18/06/2007	**BU004M**	5.7	1750	449	55.7	<0.2	<0.2	<0.2	81	<1	<1	7.8	34	249	8.2	11	0.18	1
18/12/2006	**BU005D**	4.7	3290	866	61.3	<0.2	<0.2	<0.2	12	<1	<1	12	67	403	4.9	1.8	0.08	<1
21/03/2007	**BU005D**	4.6	2960	856	60.9	<0.2	<0.2	<0.2	7.5	<1	<1	12	74	432	4.6	1.7	0.07	<1
18/06/2007	**BU005D**	4.8	2930	882	66.7	<0.2	<0.2	<0.2	8.5	<1	<1	10	70	409	4.4	2	0.08	1
18/06/2007	**BU005M**	4.8	1050	275	26.7	<0.2	<0.2	<0.2	5.5	<1	<1	2.2	18	137	2.3			
28/09/2006	**BU006D**	4.8	1110	258	27	<0.2	<0.2	<0.2	6	<1	<1	2.6	19	146	2.6	2.9	<0.02	<1
18/12/2006	**BU006D**	4.9	1200	280	24.6	<0.2	<0.2	<0.2	<1	<1	<1	3.1	20	146	2.8	3.6	0.02	<1
21/03/2007	**BU006D**	4.6	1110	279	25.7	<0.2	<0.2	<0.2	7	<1	<1	2.8	19	147	2.2	3.2	0.02	<1
18/06/2007	**BU006D**	5.6	3130	948	100	<0.2	<0.2	<0.2	49	<1	<1	20	89	386	1.7	3.3	0.02	1
28/09/2006	**BU006M**	5.4	3160	865	108	<0.2	<0.2	<0.2	48	<1	<1	24	101	390	2.2	6.1	0.06	<1
18/12/2006	**BU006M**	5.4	3400	992		<0.2	<0.2	<0.2	50	<1	<1	27	91	395	2.3	12.0	0.04	<1
21/03/2007	**BU006M**	5.2	2800	826	76.8	<0.2	<0.2	<0.2	48	<1	<1	21	77	385	1.7	8.8	0.08	<1
18/06/2007	**BU006M**	5.0	975	254	22.9	<0.2	<0.2	<0.2	20	<1	<1	1.3	15	124	4.8	13	0.05	1
28/09/2006	**BU007D**	5.5	728	217	22.6	<0.2	<0.2	<0.2	20	<1	<1	1.1	6.1	122	5.4	15.0	0.05	<1
18/12/2006	**BU007D**	5.2	1070	239	19	<0.2	<0.2	<0.2	16	<1	<1	1.5	15	125	5.2	9.0	0.08	<1
21/03/2007	**BU007D**	4.8	967	239	19.7	<0.2	<0.2	<0.2	21	<1	<1	1.4	14	128	4.5	13.0	0.05	<1
18/06/2007	**BU007D**	5.0	1010	270	24.6	<0.2	<0.2	<0.2	16	<1	<1	1.3	16	133	4.9	9.3	0.08	1
28/09/2006	**BU007M**	5.4	860	264	23.3	<0.2	<0.2	<0.2	14	<1	<1	1.4	19	140	5.1	9.0	0.08	<1
18/12/2006	**BU007M**	5.1	1110	263		<0.2	<0.2	<0.2	18	<1	<1	1.5	17	133	5	9.8	0.08	<1
21/03/2007	**BU007M**	4.8	1040	262	21.4	<0.2	<0.2	<0.2	14	<1	<1	1.4	17	137	5	9.9	0.08	<1
18/06/2007	**BU007M**	4.1	1170	318	34.2	<0.2	<0.2	<0.2	<1	<1	<1	1.5	17	150	3.5	9.9	0.08	1
28/09/2006	**BU008**	4.1	1380	340	35.6	<0.2	<0.2	<0.2	<1	<1	<1	1.9	22	185	4	0.3	<0.02	<1
18/12/2006	**BU008**	4.3	1370	332	26.3	<0.2	<0.2	<0.2	<1	<1	<1	1.7	20	173	4	0.3	<0.02	<1
21/03/2007	**BU008**	3.9	1220	328	24.2	<0.2	<0.2	<0.2	<1	<1	<1	1.7	19	174	3.8	0.4	<0.02	<1
18/06/2007	**BU008**	4.9	754	192	16.7	<0.2	<0.2	<0.2	8	<1	<1	<1	11	93	4	0.45	0.02	1
28/09/2006	**BU009**	4.9	892	193	14.6	<0.2	<0.2	<0.2	8	<1	<1	<1	14	102	4.4	5.2	0.03	<1
18/12/2006	**BU009**	5.1	849	187	15.1	<0.2	<0.2	<0.2	9	<1	<1	<1	12	98	4.4	5.3	0.04	<1
21/03/2007	**BU009**	4.7	769	188	14.4	<0.2	<0.2	<0.2	8.5	<1	<1	<1	11	100	4.3	4.9	0.03	<1
18/06/2007	**BU009**	5.7	4260	1450	95.6	<0.2	<0.2	<0.2	46	<1	<1	32	105	578	9.9	5.4	0.03	1
28/09/2006	**BU010**	5.9	3610	1360	79.5	<0.2	<0.2	<0.2	62	<1	<1	41	123	628	11	9.3	0.37	<1
18/12/2006	**BU010**	5.6	4390	1320	81.3	<0.2	<0.2	<0.2	48	<1	<1	37	101	600	11	2.9	0.37	<1
21/03/2007	**BU010**	5.5	4350	1320	82.1	<0.2	<0.2	<0.2	71	<1	<1	37	98	630	10	11.0	0.36	<1
18/06/2007	**BU010**	5.0	777	201	21.3	<0.2	<0.2	<0.2	13	<1	<1	1.1	11	101	4.7	1.2	0.31	1
28/09/2006	**BU011D**	5.4	703	199	19.4	<0.2	<0.2	<0.2	11	<1	<1	1.4	13	117	5	4.5	0.05	<1
18/12/2006	**BU011D**	5.1	890	196	19.1	<0.2	<0.2	<0.2	13	<1	<1	1.5	11	109	5.2	4.3	0.05	<1
21/03/2007	**BU011D**	4.7	815	193	20.3	<0.2	<0.2	<0.2	13	<1	<1	1.3	11	114	5.1	4.1	0.05	<1
	Minimum	3.9	703.0	187.0	14.4	0.0	0.0	0.0	4.5	0.0	0.0	1.1	6.1	93.0	1.7	0.1	0.0	1.0
	Maximum	6.0	13500.0	4850.0	617.0	0.0	0.0	0.0	112.0	0.0	0.0	80.0	419.0	2460.0	11.0	20.0	0.6	1.0

Appendix 3: Site Water Balance

Burekup water balance for 2009



APPENDIX 2
Vegetation and Flora Management Plan

ILUKA

Iluka Resources Limited

Vegetation and Flora Management Plan

Burekup Mineral Sands Project

November 2007

ILUKA-TR

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1. INTRODUCTION

This plan relates to the management of vegetation and flora at the Burekup mine site. This plan has been developed in conjunction with the Burekup Environmental Protection Statement (EPS) impact assessment document. Implementation of this plan and compliance during operations is a commitment of the EPS document.

2. ENVIRONMENTAL OBJECTIVE

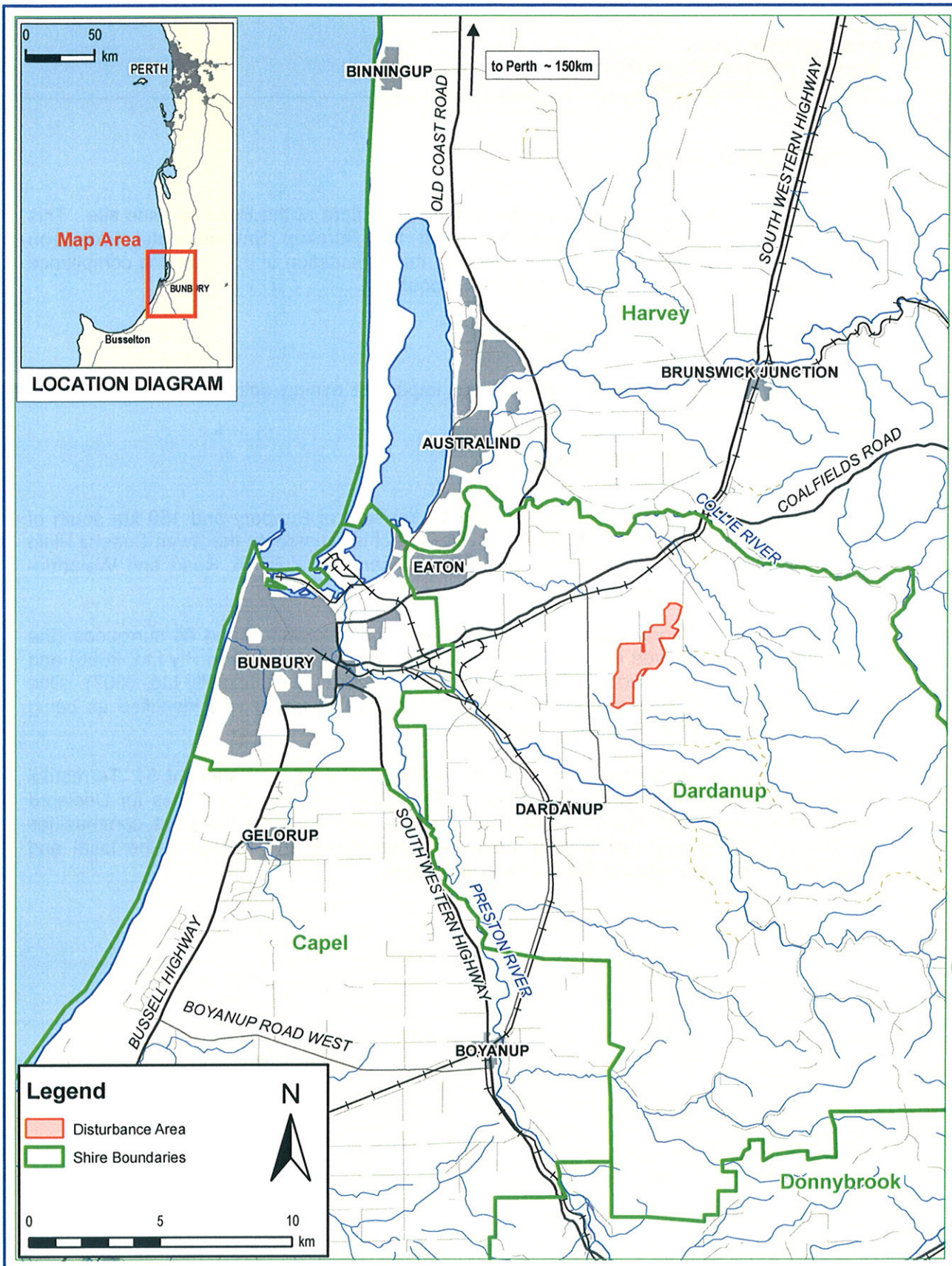
The objective of this plan is to minimise the impact of mining activities on the flora and vegetation at Burekup.

3. PRE- MINE ENVIRONMENT

The proposed mine is located approximately 11 km east of Bunbury and 150 km south of Perth, in the Shire of Dardanup (Figure 1). The Project is situated on the Swan Coastal Plain on mining tenements M70/652 and M70/720, between Henty Brook Road and Waterloo-Dardanup Road (Figure 2).

The vegetation and flora within the proposed area of disturbance and its surrounds (the Study Area) was surveyed in early December 2005 (Mattiske Consulting Pty Ltd, 2006) and supplemented by further work in September 2007 (Mattiske Consulting Pty Ltd, 2007). Due to unseasonably cool and wet spring weather in 2005, December was identified as being within the optimal range for surveying at Burekup.

The surveys were conducted in accordance with EPA Guidance Statement 51: Terrestrial Flora and Vegetation Surveys (EPA, 2004). The surveys included searches for Declared Rare Flora (DRF) and Priority Flora (PF), defining and mapping the plant communities present, assessing the condition of the plant communities and reviewing the local and regional conservation value of the flora and vegetation.



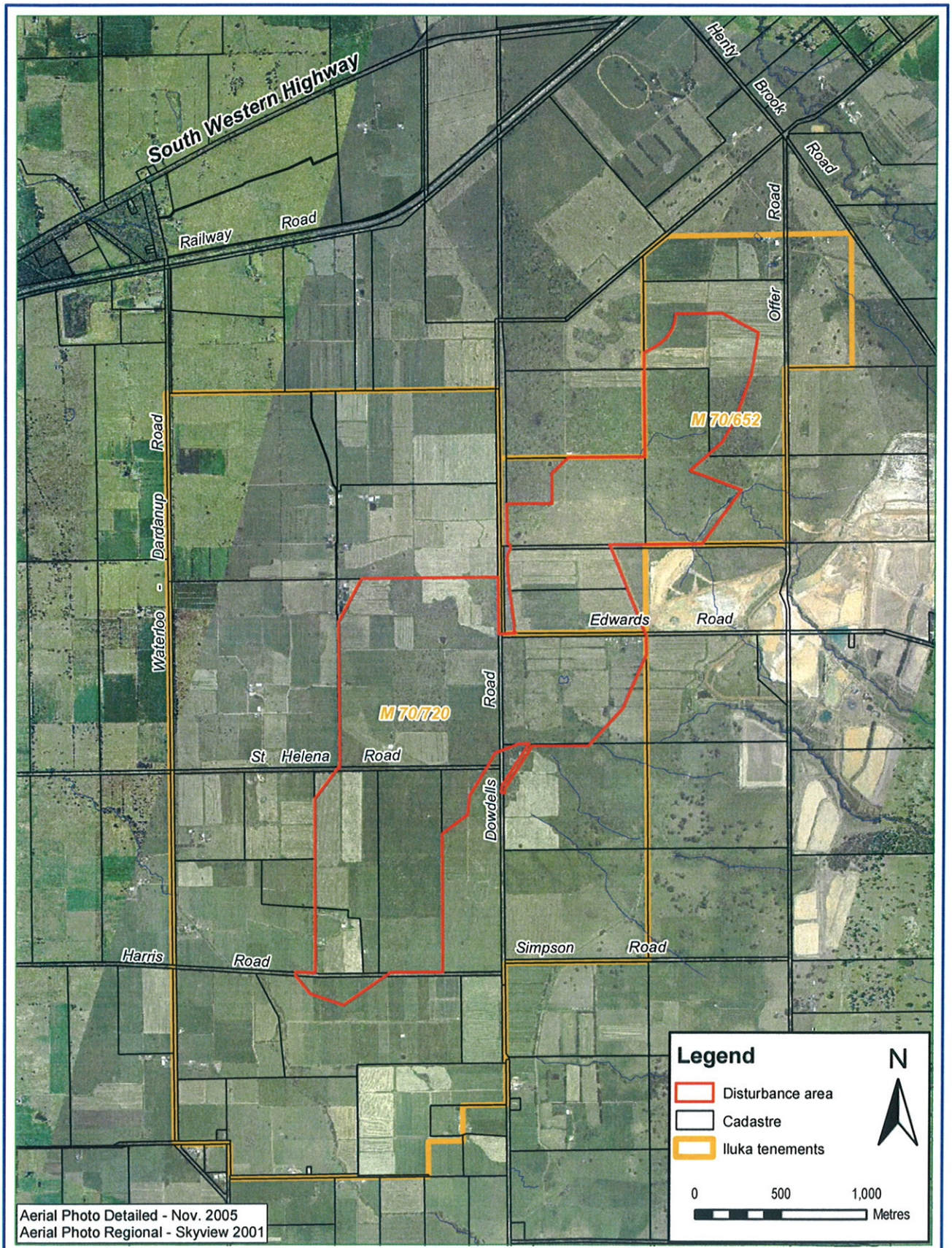
BUREKUP

REGIONAL LOCATION PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:200,000 (A4) DATE: 23 Nov. 2007 DWG No: 170435 ver.02

FIGURE: 1



BUREKUP

SITE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 170439 ver.03

FIGURE: 2

3.1. Flora

In the flora and vegetation surveys conducted by Mattiske Consulting Pty Ltd (2006, 2007), a total of 199 taxa (including subspecies and varieties) from 139 genera and 53 families were recorded within the Burekup study area. Representation was greatest among the Poaceae (28 species), Papilionaceae (18 species), Myrtaceae (16 species), Cyperaceae (15 species), and Mimosaceae (11 species). 24 Poaceae, 7 Papilionaceae and 3 Cyperaceae were weed species. The families with the highest native representation were Myrtaceae (16 species), Cyperaceae (12 species) and Mimosaceae (10 species).

No Declared Rare Flora (DRF) species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950* and as listed by the DEC (2007) were located during the survey. No plant taxa pursuant to section 179 of the *Environmental Protection Biodiversity Conservation Act 1999* were located in the study area. Though several PF species have previously been recorded in and near the disturbance area (Figure 3), no Priority Flora (PF) species were recorded in the survey area during either survey.

Significant species

The EPA noted in a letter to Iluka on 2 May 2007 that the study area contains the southernmost known occurrence of *Casuarina obesa* on the eastern side of the Swan Coastal Plain. The EPA therefore considers this occurrence significant. The EPA also noted that a stand of *Eucalyptus wandoo* within the study area is one of the most extensive known stands of mixed age that far south on the Pinjarra Plain. The EPA also notes that the *Corymbia haemotoxylon* located within the study area could be considered a disjunct and significant population.

Introduced and Declared Plant Species

A total of 86 of the 199 taxa recorded in flora surveys were introduced or weed species (Mattiske Consulting Pty Ltd, 2007). Four of the 86 species are Declared Plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976*:

- *Acacia dealbata* (Silver Wattle) P1, P2;
- *Rubus fruticosus* agg. (Blackberry) P1, P4;
- *Asparagus asparagoides* (Bridal Creeper) P1; and
- *Gomphocarpus fruticosus* (Narrowleaf Cotton Bush) P1, P4.

3.2. Vegetation

The Study Area is located within the Drummond Botanical Subdistrict of the South-western Botanical Province (Diels, 1906; Gardner, 1942; and Beard, 1979 and 1980; cited in Mattiske Consulting Pty Ltd, 2006); the Guildford vegetation complex as defined by Heddle *et al.* (1980a) and cited in Mattiske Consulting Pty Ltd, 2006; and the Swan Coastal Plain Bioregion as defined by Thackway and Cresswell (1995) and the Department of the Environment and Heritage (2006b) under the Interim Biogeographical Regionalisation for Australia (IBRA) cited in Mattiske Consulting Pty Ltd, 2006.

The Drummond Botanical Subdistrict is a low-lying coastal plain with sandy soils and swampy deposits, in a warm dry Mediterranean climate. The vegetation is typically *Banksia* low woodland on leached sands, *Melaleuca* wetlands in areas of poorer drainage, and *Eucalyptus gomphocephala / E. marginata / Corymbia calophylla* woodlands on soils with a higher nutrient content (Beard, 1990; cited in Mattiske Consulting Pty Ltd, 2006).

The Guildford vegetation complex is defined as, "A mixture of open forest to tall open forest of *Corymbia calophylla – Eucalyptus wandoo – Eucalyptus marginata* and woodland of *Eucalyptus wandoo*. Minor components include *Eucalyptus rudis – Melaleuca rhaphiophylla*." The Swan Coastal Plain Bioregion is characterised by *Banksia* sp. and *Eucalyptus gomphocephala* (Tuart) woodlands on sandy soils, *Casuarina obesa* woodlands on outwash plains (with *Corymbia calophylla* to the south), and *Melaleuca* sp. woodlands on swampy areas (DEC 2006a, cited in Mattiske Consulting Pty Ltd, 2006).

Mattiske Consulting Pty Ltd (2006) notes that the Guildford vegetation complex has been largely cleared for agricultural activities and is under represented in the conservation estate. In a letter to Iluka dates 2 May 2007, the EPA notes that within the Greater Bunbury Region of the Swan Coastal Plain, only 4.4 % of the original extent of the Guildford vegetation complex remains.

The study area has been extensively cleared for agricultural purposes and contains isolated trees and several areas of native vegetation. Nine vegetation communities were recorded, as described in Table 1 and shown in Figure 5 to Figure 11.

Table 1: Vegetation communities recorded in the study area

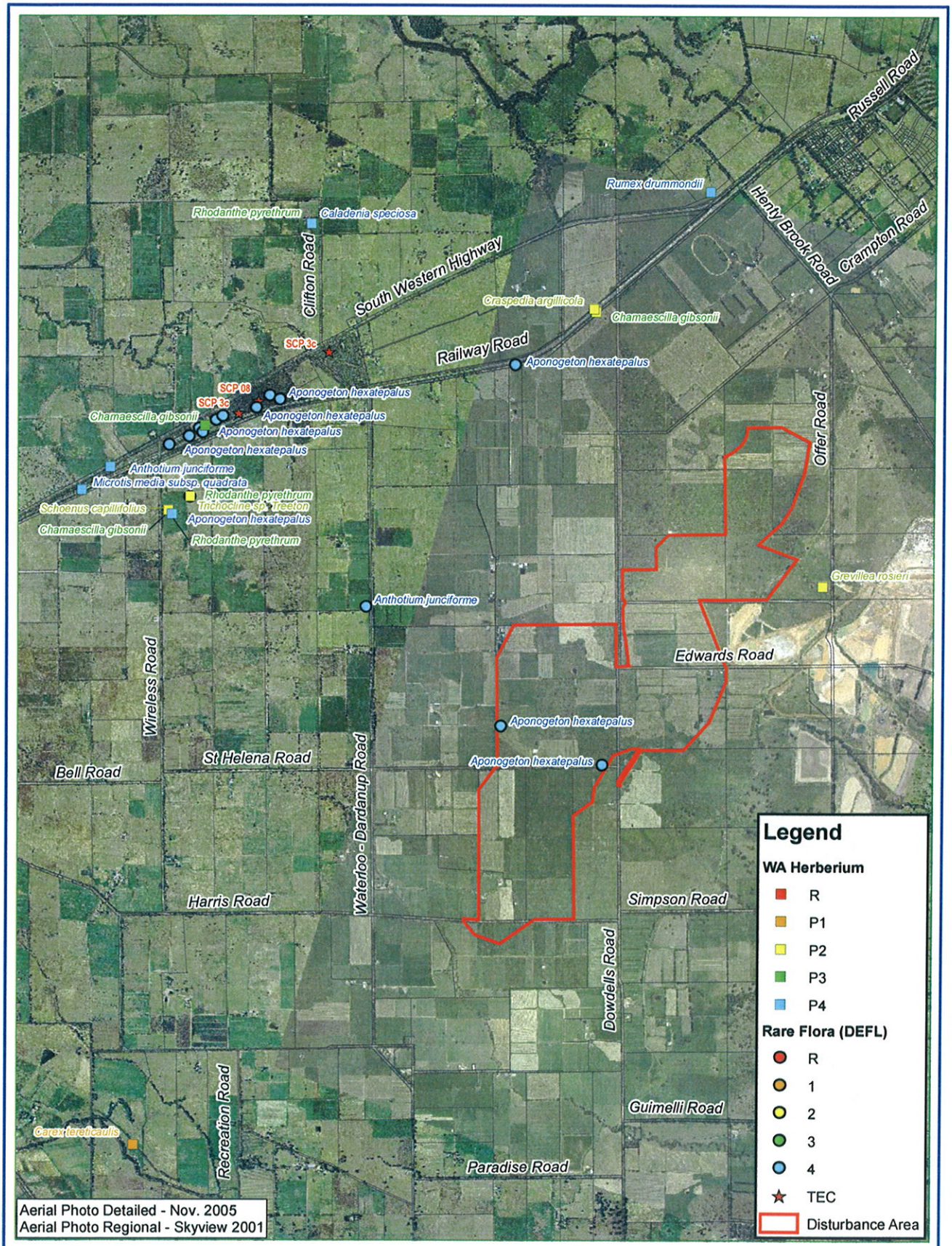
Community Code	Description	Condition Rating
A1	Woodland of *Agonis flexuosa – Corymbia calophylla – Eucalyptus rudis* over weeds on loam soils along flowlines	5
C1	Woodland of *Corymbia calophylla – Eucalyptus wandoo* over *Xanthorrhoea preissii, Hypocalymma angustifolium* and weeds on sandy-loam soils.	3, 4, 5
C2	Woodland to forest of *Corymbia calophylla – Eucalyptus rudis – Melaleuca rhaphiophylla – Melaleuca preissiana* over weeds on loam soils.	3, 4, 5
C3	Low woodland of *Casuarina obesa* over *Melaleuca viminea* subsp. *viminea* and *Hakea varia* over *Chorizandra enodis* on sandy loam soils	4, 5
C4	Forest of *Corymbia calophylla* over *Banksia grandis, Xanthorrhoea preissii* and *Kingia australis* over *Cyathochaeta avenacea* on sandy loam soils.	4
C5	Woodland to forest of *Corymbia calophylla – Corymbia haemotoxylon* over *Xanthorrhoea preissii* over *Cyathochaeta avenacea* on sandy loam soils	5
E1	Woodland of *Eucalyptus wandoo* over *Melaleuca rhaphiophylla* over pasture on loam soils	5
M1	Low woodland to forest of *Melaleuca rhaphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils	5
M2	Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateritia, Viminaria juncea, Acacia saligna* and *Hakea varia* over *Lepidosperma longitudinale* on clay-loam soils	3, 4, 5

The condition of vegetation was rated according to the scale used for assessing Bush Forever sites (Table 2; Government of Western Australia, 2000).

Table 2: Vegetation condition rating scale

Rating	Description	Explanation
1	Pristine	Pristine or nearly so, no obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent fires, aggressive weeds at high density, partial clearing, dieback and grazing.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds, partial clearing, dieback and grazing.
6	Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.

The majority of the site is either completely degraded (condition rating 6) or degraded (condition rating 5). Where native vegetation is present, it is generally native tree overstorey with weed/pasture species forming the understorey. There are several isolated remnants of good (condition rating 4) or very good (condition rating 3) vegetation which are mostly in or adjacent to road reserves (Figure 12).



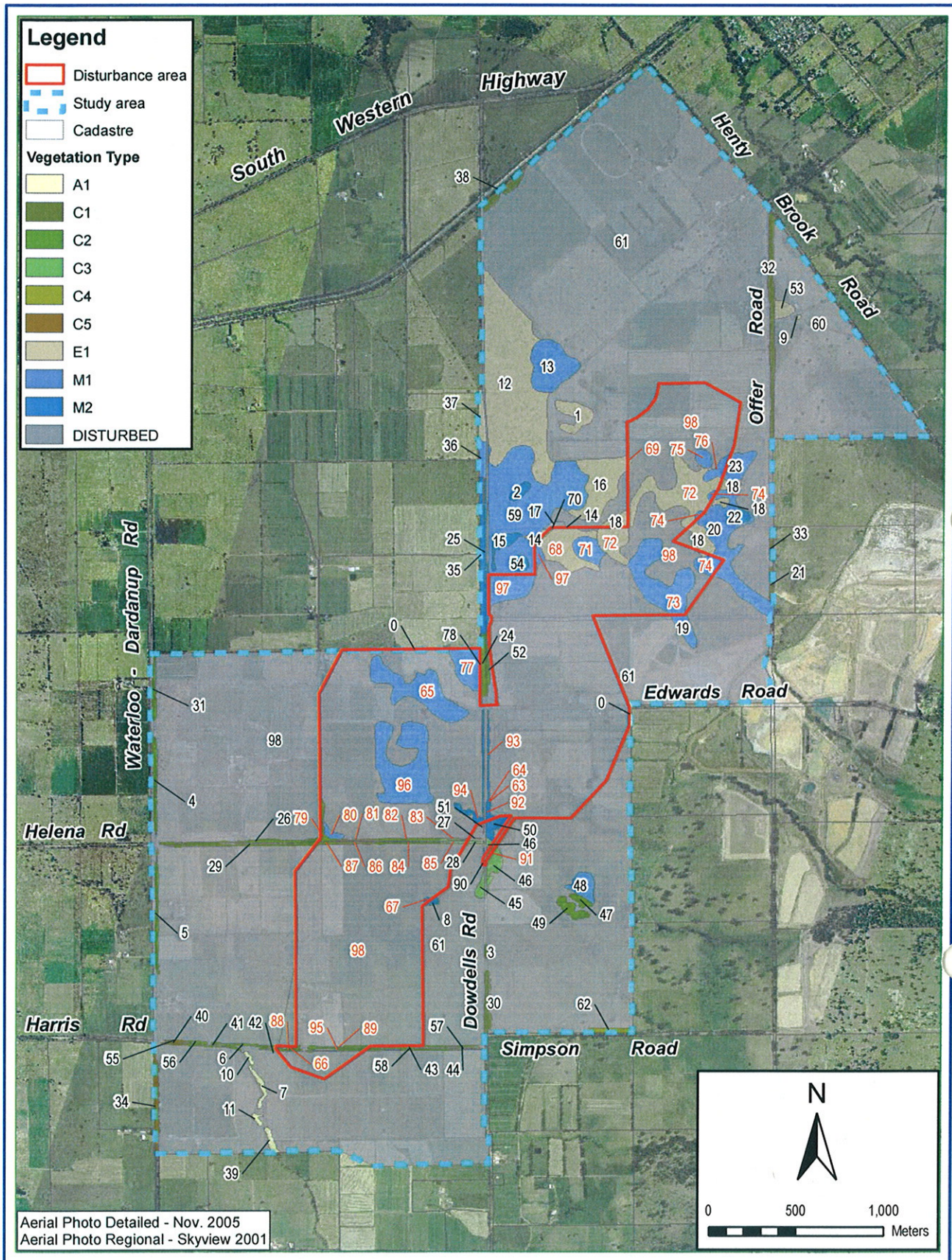
BUREKUP

PRIORITY FLORA and TEC's

ILUKA

ORIG:S.Jones DRAWN: T.L.G SCALE: 1:40,000 (A4) DATE: 23 Nov. 2007 DWG No: 178375 ver.00

FIGURE: 3



BUREKUP

VEGETATION TYPE

ILUKA

ORIG:S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 176739 ver.01

FIGURE: 4

Figure 5: Community A1

Figure 6: Community C1

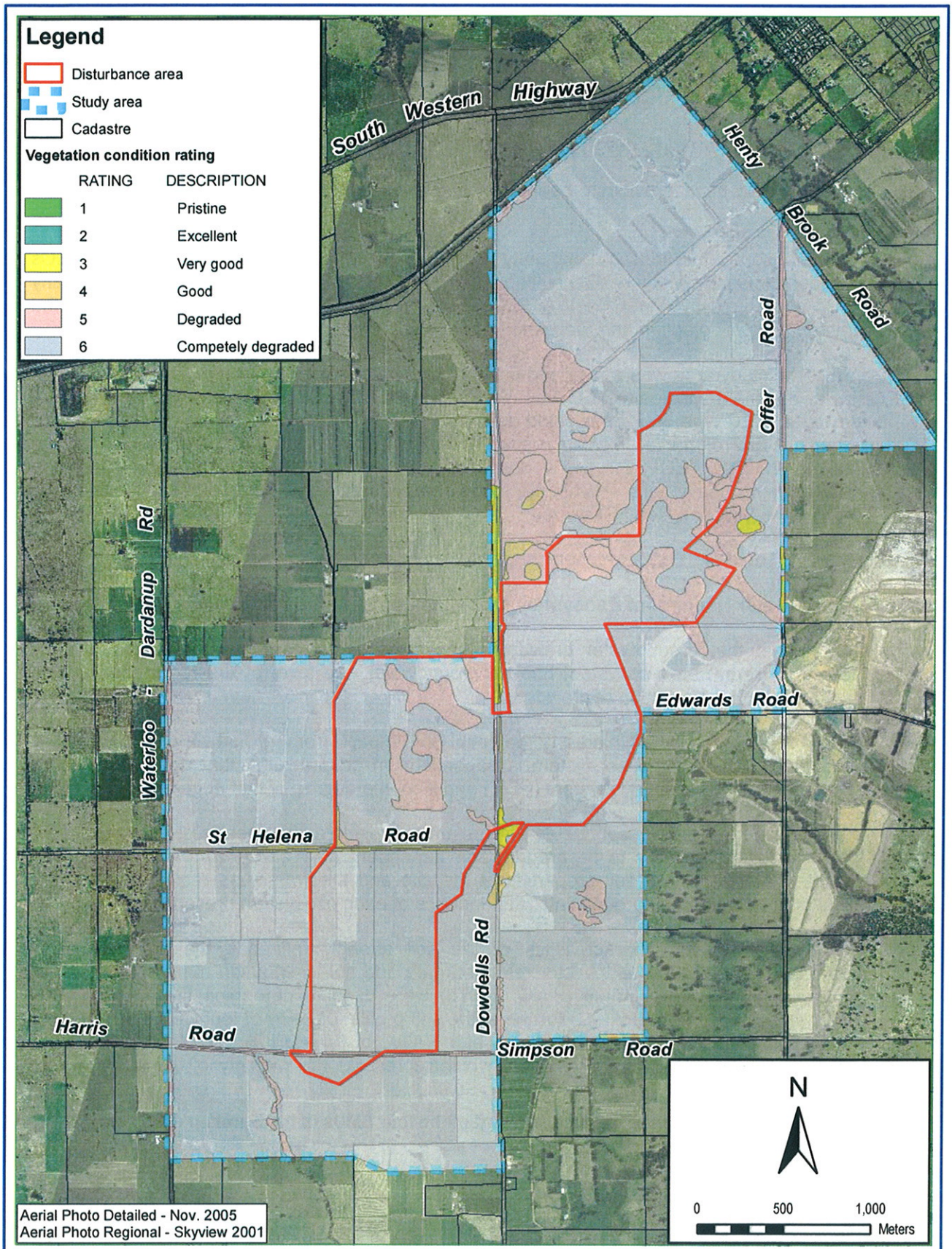
Figure 7: Community C2

Figure 8: Community C3

Figure 9: Community E1

Figure 10: Community M1

Figure 11: Community M2



BUREKUP

VEGETATION CONDITION

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000(A4) DATE: 23 Nov. 2006 DWG No: 176624 ver.02

FIGURE: 12

Potential Threatened Ecological Communities (TECs)

Several TECs have previously been identified to the north west of the disturbance area (Figure 3).

A comparison of the floristic community types present within the study area to these TECs was conducted by Mattiske Consulting Pty Ltd (2006) to determine the presence of any TECs as defined by either the WA TEC Scientific Advisory Committee or listed under the *Environmental Protection and Biodiversity Conservation Act 1999.*

Within the study area was a localised patch of *Corymbia calophylla* community (C4) that has similar dominant species to TEC Community type SCP 3a, although has low overall floristic similarity. TEC type SCP 3a is listed as critically endangered by the State and endangered under the *Environmental Protection and Biodiversity Conservation Act* (Mattiske Consulting Pty Ltd 2006). TEC SCP 3a is described as *Corymbia calophylla – Kingia australis* woodlands on heavy soils. Within the study area, community C4 was restricted to a 0.6 ha area on the Simpson Road Reserve (

Figure 4; Table 4). The vegetation condition was rated as "good" (Figure 12).

Groundwater Dependent Ecosystem Classification

The impact that groundwater drawdown has on ecosystems is related to the level of dependence that the ecosystem has on groundwater, the level of drawdown, the rate of drawdown and the duration of drawdown.

The first step in determining the potential for impact from groundwater drawdown is determining whether the ecosystem is dependent on groundwater, that is, whether it is a groundwater dependent ecosystem (GDE) and if so, the degree of that dependence.

Investigations have been conducted at Burekup to provide a site specific assessment of the potential for ecosystems to be groundwater dependent (SWC, 2007a). This assessment includes information on soil properties at the site and the water use requirements of the vegetation to determine groundwater dependence of each ecosystem present.

The water retention characteristics of the soil strongly influence the dependence of vegetation on groundwater. Water retention data and soil distribution mapping from a soil survey conducted at Burekup (SWC, 2007b) were used to determine the average plant available water content (PAWC) for the entire soil profile for each of four SMUs present. All SMUs within the Project have a relatively high PAWC of 8.4 – 9.1 %. The PAWC is strongly influenced by the Guildford Formation, which represents the majority of the soil profile in each SMU.

Table 3: Plant available water content of the four SMUs in the Burekup mine area

Soil Management Unit (SMU)	PAWC (m^3/m^3)
SMU 1: Uniform Brown Grey Heavy Clay	0.084
SMU 2: Gradational Pale Grey Sand – Yellow Sandy Loam	0.087
SMU 3: Pale Grey – Brown Sandy Duplex	0.085
SMU4: Yellow – Brown Mottled Duplex	0.091

Each vegetation community identified in the vegetation surveys (Mattiske Consulting Pty Ltd, 2006, 2007) has been broken down into specific sites and assessed, considering the soil profile and the depth to groundwater underlying it, determined from the soil distribution model. The transpiration for all vegetation was assumed to be 600 mm/year. Given the quality and density of the vegetation remaining in the vicinity of the Project, this transpiration rate is likely to overestimate actual water use requirements of the vegetation in the area, and will result in an overestimation of the groundwater dependency of the vegetation.

By multiplying the PAWC of the soil beneath vegetation by the depth to groundwater beneath that vegetation, the amount of soil water available to that vegetation can be determined. By dividing that amount by the volume of water transpired by the vegetation, the percentage of the vegetation's water requirements which are available from the soil profile can be determined. Where the volume of water available in the soil profile exceeds the volume required by the vegetation, the vegetation is not dependent on groundwater for survival. Where the volume of water available in the soil profile is less than the volume required by the vegetation, the vegetation is dependent on groundwater. The level of dependence is determined by the percentage of the vegetation's water requirements that can be supplied from the soil profile. SWC (2007a) designates GDE classes as follows:

- Class 1: 80 % dependence on groundwater
- Class 2: 50 % dependence on groundwater
- Class 3: 20 % dependence on groundwater
- Class 4: No dependence on groundwater

Using the SMU and depth to water information, and the PAWC for each SMU, a GDE classification was determined for each vegetation site identified at Burekup and the risks and possible impacts associated with each potential GDE were determined.

The majority of vegetation in the vicinity of the Project is not dependent on groundwater (non-phreatophytic). Rather, the vegetation is reliant on soil moisture. Isolated areas of lower depth to groundwater occur, are where the vegetation has a degree of dependence on groundwater. From the assessment, groundwater dependent vegetation is restricted to the central and eastern portions of the proposed mine site (SWC, 2007a).

Vegetation sites 3 and 30 (C1), 47 and 49 (C2), 27, 28, 45 and 46 (C3), 48 (M1) and 50 and 51 (M2) were considered to have some degree of groundwater dependency. Seven of these sites are rated as condition 5 (degraded), 4 are condition 4 (good) and 50 are condition 3 (very good).

The degree of impact likely for each vegetation site is dependent on the class of GDE (how dependent they are on groundwater) and the predicted drawdown beneath that vegetation. Vegetation with a GDE classification of class 1 is more susceptible to decreases in water level than a GDE of class 3, and the greater the decrease in water levels, the greater the potential for impact. For each GDE class, there is a threshold of groundwater drawdown, below which no impact is likely (Froend and Zencich, 2001; cited in SWC, 2007a). The threshold for class 1 GDEs is 0.75 m; for class 2 GDEs is 1.25 m; and for class 3 GDEs is 1.75 m.

The maximum GDE rating applied at Burekup was class 3 (20% dependency).

4. POTENTIAL IMPACTS

4.1. Clearing

It is currently anticipated that the extent of mining will disturb a maximum of approximately 374.5 ha of land, of which only 0.5 ha was rated as "very good" (condition rating 3) under the Bush Forever condition rating scale. A further 3.1 ha of native vegetation was assessed as being 'good' (condition rating 4). Approximately 59 ha was mapped as 'degraded' vegetation (condition rating 5) consisting of native trees within cleared farmland. The areas mapped as condition five vegetation communities are heavily grazed. Within these communities, large cultivated areas exist with no vegetation remaining. The area of actual clearing of condition 5 vegetation is therefore considered to be significantly less than 59 ha. The remaining area of potential disturbance, 312 ha, is cleared agricultural land described as 'completely degraded' (condition rating 6; Figure 12) with isolated trees in paddocks. This area includes disturbance from mining, stockpiles, plant and infrastructure, process water ponds and solar drying dams.

Of the nine communities identified within the survey area, seven occur within the proposed disturbance area. These communities and their occurrences within the study area and disturbance area are outlined in Table 4 and shown in Figure 4.

Table 4: Vegetation communities within the study area and the disturbance area

Community Code	Condition rating	Area within Study Area (ha)	Area within Disturbance Area (ha)
A1	5	1.6	0.0
C1	3	0.7	0.0
	4	0.5	0.5
	5	6.5	0.0
C2	3	1.4	0.1
	4	3.8	1.6
	5	7.6	1.3
C3	4	2.6	0.4
	5	0.4	0.2
C4	4	0.6	0.0
C5	5	1.6	0.0
E1	5	60.5	16.3
M1	5	82.7	39.4
M2	3	5.8	0.4
	4	3.4	0.6
	5	1.8	1.6
Disturbed		1121.4	312.0
TOTAL		1303.0	374.5

4.2. Groundwater Drawdown

Groundwater drawdown caused by pit dewatering has the potential to impact GDEs. Groundwater drawdown impacts on vegetation have been assessed using maximum

predicted groundwater drawdown contours and the GDE class. The response curves and risk assessment methodology from Froend, Bowen and Associates (2004) have been adapted to assess risk levels (Table 5). The potential impacts on vegetation associated with the assigned risk level are outlined in Table 6. Table 7 shows the GDE vegetation areas and associated areas at risk of impact.

Table 5: Assignment of risk category to GDE class

GDE class	Groundwater drawdown threshold			
	< 0.75	> 0.75	> 1.25	> 1.75
1	Low	Moderate - High	High	High
2	Low	Low - Moderate	Moderate – High	Moderate - High
3	Low	Low	Low	Low - Moderate
4	None	None	None	None

Table 6: Expected impact of groundwater dependent ecosystem risk ratings

Risk	Expected Impact
Low	No significant change in distribution of species
Low – Moderate	Some evidence of changing distribution of species and encroachment of more drought tolerant species
Moderate – High	Measurable change in the demographics of some species with encroachment of more drought tolerant species
High	Overstorey or understorey decline and/or loss of species. Greater than 50 % reduction in abundance of dominant species. For wetland vegetation possibly complete drying out of wetland basin or reduction in period of inundation

Table 7 identifies the GDE vegetation areas and associated areas at risk of impact.

Table 7: Drawdown impacts on vegetation

Vegetation Community	Vegetation Area Number	Condition	Area in hectares			
			Low	Low - Mod	Mod - High	High
C1	3	5	-	0.2	-	-
	30	5	-	1.1	-	-
C2	47	5	0.5	-	-	-
	49	5	1.1	-	-	-
C3	27	4	-	<0.1	-	-
	28	5	-	0.1	-	-
	45	4	-	0.6	-	-
	46	4	-	1.4	-	-
M1	48	5	1.7	-	-	-
M2	50	3	-	0.9	-	-
	51	5	-	<0.1	-	-
Total			**3.3**	**4.5**	-	-

From Table 7, the following impacts are expected on the GDEs identified at Burekup:

Vegetation Areas 3 and 30 – Vegetation Community C1

This vegetation, classified as degraded, is located on the Dowdells Line Reserve near Harris Road. Groundwater is approximately 7-8 m below the soil surface and the site has subsequently been described as a class 3 GDE. Maximum groundwater drawdown in the vicinity of this GDE is expected to be 2 m. Therefore, a low to moderate risk of impact is expected (SWC 2007a).

Vegetation Areas 47 and 49 – Vegetation Community C2

This vegetation, located east of Dowdells Line Road between Edwards and Simpson Roads, has been classified as degraded. Groundwater is approximately 6.5 m below surface and the site has therefore been described as a class 3 GDE. Groundwater drawdown is anticipated to be at a maximum of 1 to 1.5 m. A low risk of impact exists to this vegetation with no significant change expected (SWC 2007a).

Vegetation Areas 27, 28, 45, 46 – Vegetation Community C3

These sites, located near St Helena Road and Dowdells Line Road are classified as being in good and degraded condition. With groundwater at approximately 6 m below the soil surface, these sites are class 3 GDEs. Maximum groundwater drawdown is expected to be 2 m. The vegetation therefore has a low to moderate risk of impact (SWC 2007a).

Vegetation Area 48 – Vegetation Community M1

This degraded vegetation located east of Dowdells Line Road between Edwards and Simpson Roads is classified as a class 3 GDE. With maximum drawdown anticipated to be between 1 and 1.5 m, this vegetation has a low risk of impact with no significant change expected (SWC 2007a).

Vegetation Area 50 and 51 – Vegetation Community M2

These sites, located on the Dowdells Line Reserve near St Helena Road are classified as being in very good condition. The vegetation is a class 3 GDE with pre-mining groundwater levels being approximately 7 m below surface. Maximum groundwater drawdown is expected to be 2 m under this vegetation, giving a low to moderate risk of impact (SWC 2007a).

Conservation Category Wetland

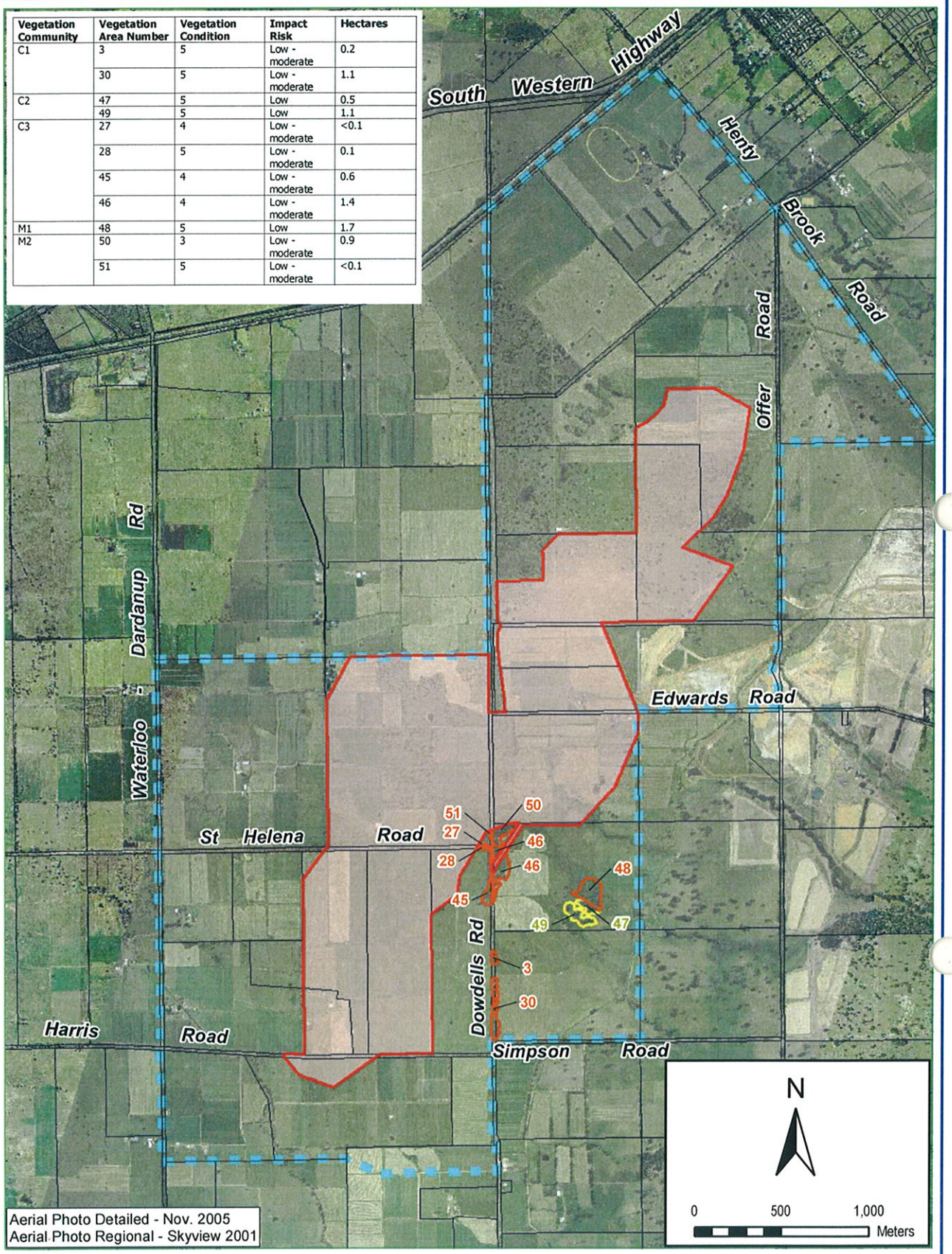
The conservation category wetland is approximately 100 m east of the proposed pit. Groundwater occurs at a depth exceeding 15 m below surface, thus the vegetation has no dependency on groundwater.

Resource Enhancement Wetland

The resource enhancement wetland is over 500 m from the pit. Groundwater occurs at a depth exceeding 10 m below surface, thus vegetation has no dependency on groundwater.

GDEs at Burekup that have been assessed to be at low to moderate risk of impact are presented in Figure 13.

Vegetation Community	Vegetation Area Number	Vegetation Condition	Impact Risk	Hectares
C1	3	5	Low - moderate	0.2
	30	5	Low - moderate	1.1
C2	47	5	Low	0.5
	49	5	Low	1.1
C3	27	4	Low - moderate	<0.1
	28	5	Low - moderate	0.1
	45	4	Low - moderate	0.6
	46	4	Low - moderate	1.4
M1	48	5	Low	1.7
M2	50	3	Low - moderate	0.9
	51	5	Low - moderate	<0.1



Legend

Disturbance area

Study area

Ground Dependant Ecosystems

Impact Risk

Low - Moderate

Low

BUREKUP

GROUNDWATER DEPENDANT ECOSYSTEMS

RISK OF IMPACT

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 178373 ver.00

FIGURE: 13

4.3. Assessment of Vegetation Impacts

Considering both the direct (clearing) and indirect (groundwater drawdown) impacts outlined in sections 4.1 and 4.2, the maximum potential impact on vegetation communities is outlined in Table 8.

Table 8: Assessment of vegetation impacts

Vegetation community	Condition	Area surveyed (ha)	Clearing (ha)	Groundwater drawdown (ha)*	Total impact area (ha)	% of area surveyed
A1	5	1.6	0.0	0.0	0.0	0
C1	3-5	7.7	0.5	1.3	1.8	23 %
C2	3-5	12.8	3.0	0.0	3.0	23 %
C3	4-5	3.0	0.6	2.2	2.8	93 %
C4	4	0.6	0.0	0.0	0.0	0
C5	5	1.6	0.0	0.0	0.0	0
E1	5	60.5	16.3	0.0	16.3	27
M1	5	82.7	39.4	0.0	39.4	48
M2	3-5	11.0	2.6	1.0	3.6	33
TOTAL		**181.5**	**62.4**	**4.5**	**66.9**	

* Areas of > low – moderate risk as identified in Table 7.

4.4. Declared Plants

Unmanaged, Declared Plants such as the Silver Wattle (P1, P2), Blackberry (P1, P4), Bridal Creeper (P1) and Narrowleaf Cotton Bush (P1, P4) have the potential to spread via transfer of seeds or root stock.

5. MANAGEMENT

5.1. Clearing Controls

Iluka has sought to minimise clearing of native vegetation when designing the Project. Prioritisation has been given to avoiding, where practicable, vegetation that has been rated as very good and good. Whilst there is unlikely to be scope to reduce clearing further, review of plans and designs will continue with the aim to minimise the Project's clearing footprint.

Whilst clearing is necessary for the development of the Project, controls must be put in place to prevent unplanned, excessive or unapproved clearing. This may include measures such as installing surveyed pegs, flagging tape or paint marking to delineate clearing boundaries.

5.2. Groundwater Dependent Ecosystems

There are limited areas that have been classified as being potentially groundwater dependent, with the greatest risk of vegetation impact being described as low-moderate. If

vegetation is impacted by groundwater drawdown, Iluka will conduct infill planting to at least the same density for the species affected.

5.3. Declared Plants

Declared Plants must be managed in accordance to their classification. For the four species recorded, movement of the plant or its seeds is prohibited, including movement of contaminated machinery, livestock, fodder and other produce. Infestations of *Acacia dealbata* (Silver Wattle) must be destroyed and propagation prevented until all plants have been eradicated; and *Rubus fruticosus* (Blackberry) and *Gomphocarpus fruticosus* (Narrowleaf Cotton Bush) must be treated by destroying plants and/or preventing production of seeds and propagules. Herbicides to control Blackberry must be selected carefully as some stimulate propagation via suckering.

Iluka will implement an ongoing weed control program throughout the mine life to treat infestations of Declared Plants.

6. MONITORING

A visual vegetation assessment shall be conducted at the end of mining to identify any impacts to groundwater dependent vegetation.

Rehabilitation monitoring will also be conducted as described in the Rehabilitation Management Plan.

7. CONTINGENCY PLANS

In the event that is it found that there has been an adverse impact to vegetation and that the impact is attributable to mining, infill planting will be undertaken to restore the vegetation comparable to its pre-mining condition.

If Declared Plants are located during the operational phase of the project or in rehabilitation, actions will be taken to destroy the weed as soon as practicable.

8. REPORTING

The results of visual monitoring of vegetation and rehabilitation monitoring will be reported in the Annual Environmental Report (AER).

9. REVIEW AND REVISE

This management plan will be reviewed to assess its suitability, adequacy and effectiveness annually, or more frequently as deemed necessary by Iluka. Where necessary, the plan will be revised and submitted to the DEC for approval.

10. KEY MANAGEMENT ACTIONS TABLE

Table 9: Key Management Actions

Key Management Actions	Evidence of demonstration
Clearing boundaries will be delineated to prevent excess clearing	Clearing footprint
Clearing will not occur within 100 m of the conservation category wetland or 200 m of the resource enhancement wetland.	Clearing footprint
Conduct infill planting in areas affected by groundwater drawdown	Rehabilitation records
Conduct rehabilitation as soon as practicable after mining	Rehabilitation progress reported annually in the Annual Environmental Report
Ongoing treatment of Declared Plants throughout mine life	Records of weed extermination

11. REFERENCES

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12. DOCUMENT CONTROL

Revision	Reviews/changes	Create date
A	First Draft	27 September 2007
B	SJ Review	12 November 2007
C	Comments incorporated	13 November 2007
D	Internal Review	14 November 2007
E	Comments incorporated	22 November 2007
F	Finalised for submission	23 November 2007

APPENDIX 3
Noise Management Plan

ILUKA

Iluka Resources Limited

Noise Management Plan

Burekup Mineral Sands Project

November 2007

Version D

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1. INTRODUCTION

This Plan relates to noise from the Burekup mine site. This plan has been developed in conjunction with the Environmental Protection Statement (EPS) impact assessment document. Implementation of this plan and compliance during operations is a commitment of the EPS document.

2. ENVIRONMENTAL OBJECTIVE

The objective of this plan is to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

3. PRE- MINE ENVIRONMENT

The Burekup site is located on agricultural land, approximately 11 km from Bunbury, in the Shire of Dardanup. There are a number of residences located in the vicinity of the Burekup site. A total of 11 residences were included in noise modelling exercises (see Figure 1). A Mineral Sands Mine currently exists in the area and may contribute to background noise.

Background noise levels have been monitored at four locations surrounding the Burekup site for a period of two weeks in March 2007. Monitoring found that the background noise levels in the area are very low, typically 25 to 29 dB(A) (L90 of LA90) during both day time and night time hours (SVT, 2007). The variation in L90 noise level was similar at all sites, suggesting that there is a common source of background noise at all sites. There is some correlation between the recorded LA90 noise levels and prevailing wind strengths, suggesting that background noise is weather related (SVT, 2007).

4. POTENTIAL IMPACTS

The project will generate noise from construction, mining and processing activities. The main source of noise will be mobile earth-moving equipment, though fixed plant, including roadside pumps will also contribute.

4.1. Noise regulations

Noise levels from the site are required to comply with the *Environmental Protection (Noise) Regulations (1997)* (the regulations) which stipulate noise levels at receiving locations. An influencing factor applies to one nearby residence. Influencing factors are noise allowances for certain land uses and surrounding activities for use when applying the limits prescribed in the regulations. The relevant noise limits for each receiving location are presented in Table 1.

Under regulation 13 (Construction Sites), the noise levels in Table 1 do not apply to construction noise from Monday to Saturday between 7am and 7pm when construction work is conducted in accordance with the control of environmental noise practices set out in section 6 of AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites* and the equipment used is the quietest reasonably available.

It is preferable to operate the day-time mining fleet on a 6am – 7pm daytime roster rather than 7am – 7pm. The day-time mining fleet will also operate on Sundays and public holidays.

Table 1: Noise limits at receiving locations (LA10)

Residence	Influencing factor in dB	Assigned Noise limits (LA10) in dB(A)		
		Day	Evening	Night
R1	0	45	40	35
R2	1	46	41	36
R3	0	45	40	35
R4	0	45	40	35
R5	0	45	40	35
R6	0	45	40	35
R7	0	45	40	35
R8	0	45	40	35
R9	0	45	40	35
R10	0	45	40	35
R11	0	45	40	35

4.2. Noise modelling

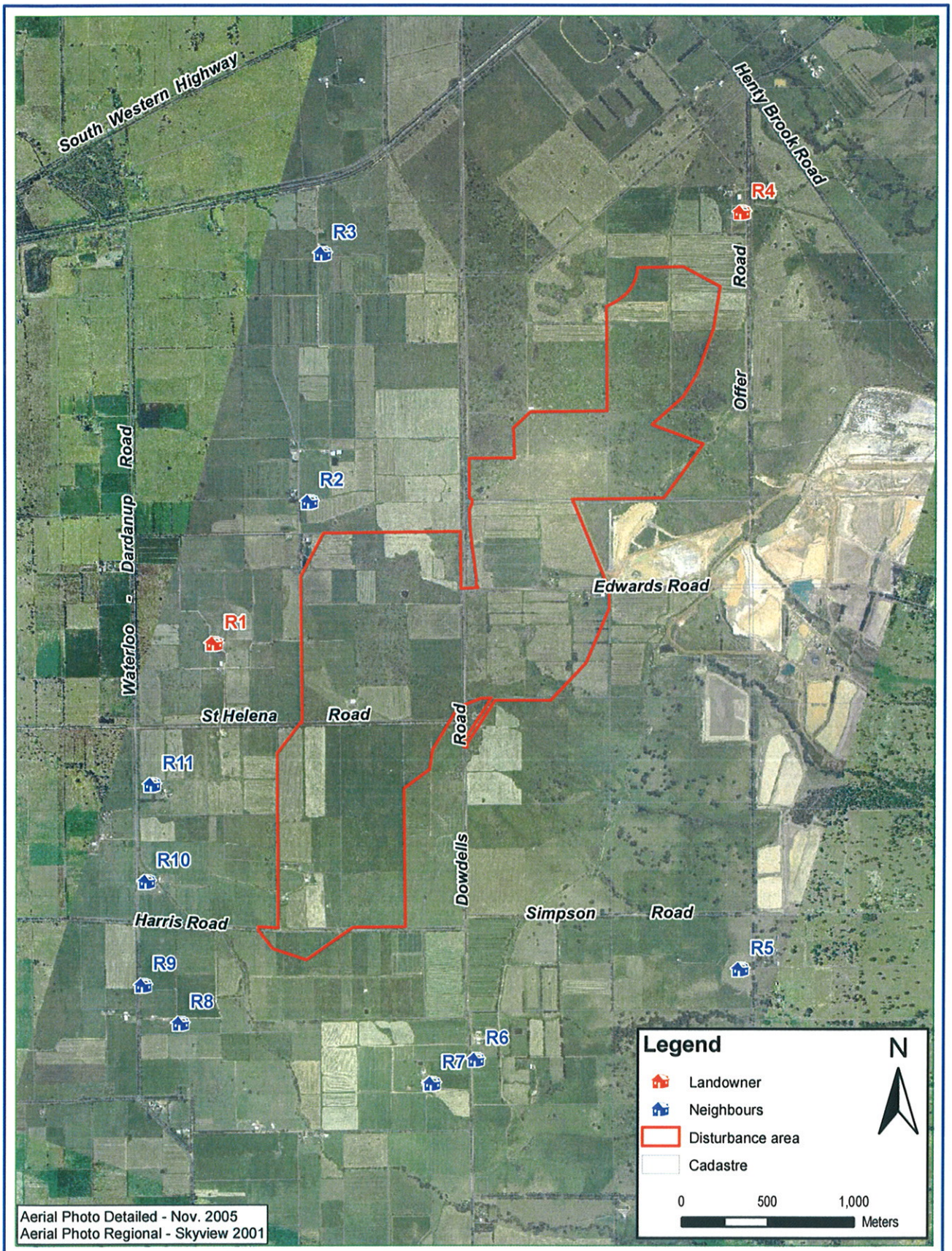
To predict the noise that may be created by the proposed mining operation, an acoustic model was developed (SVT, 2007). Equipment noise data, together with local weather data, ground topographical data and receiver locations, was used to predict noise levels at 11 nearby residences shown on Figure 1. A tonality assessment was included as part of the modelling and a 5dB(A) penalty added to the noise emitted if tonality was considered likely to be present.

Worst case predictions were applied to the following four scenarios, representing various stages of activity on the site:

- Scenario one – highest numbers of mobile machinery during construction
- Scenario two – highest numbers of mobile machinery during operations in main pit
- Scenario three – longest stage of operations (expected duration eight months)
- Scenario four – highest numbers of mobile machinery during operations (all pits)

For each residence and each of the four scenarios selected, the model predicts worst case noise levels for day and night, under calm conditions and the eight cardinal wind directions.

Noise levels emitted from the mining equipment (fixed and mobile) have been calculated from existing mine sites. With the exception of the diesel dewatering pump, this data represents the noise levels from machinery that has not been modified to reduce noise, in order to predict the maximum potential impact. The diesel dewatering pump was modelled as enclosed by a specially designed enclosure with an overall noise emission reduction of 25dB(A).



BUREKUP

RESIDENCES

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 178376 ver.00

FIGURE: 1

The model was run with 10 m noise bunds partially surrounding the concentrator, screen plant and contractor's area and a five metre noise bund partially surrounding the solar drying dam decant pumps to reduce noise impacts.

From the modelling, 6 residences are likely to experience exceedances during the day under unfavourable conditions. At night, one residence is predicted to exceed prescribed limits Table 2. Conditions that result in non-compliance with the regulations are presented in Table 3.

Table 2: Worst case noise levels for residences modelled

Residence	Assigned noise limit Day/night	Adjusted worst-case day and night noise levels in dB(A)								
		Scenario 1	Scenario 2		Scenario 3		Scenario 4		Max Exceedance	
		Day	Day	Night	Day	Night	Day	Night	Day	Night
R1	45/35	48.9	**54.7**	27.2	43.2	27.8	42.8	26.2	-	-
R2	46/36	47.4	**55.7**	29.7	**47.2**	29.7	43.9	29.7	**9.7**	-
R3	45/35	36.7	36.7	19.0	34.7	18.9	40.5	19.9	-	-
R4	45/35	33.1	32.4	16.7	33.4	16.4	**55.0**	18.2	-	-
R5	45/35	38.3	37.4	22.6	34.1	25.2	36.9	25.0	-	-
R6	45/35	45.2	43.3	25.4	**44.2**	29.5	39.4	29.5	-	-
R7	45/35	45.5	44.4	24.7	**44.3**	29.0	38.8	29.0	-	-
R8	45/35	48.8	46.8	25.0	44.5	**34.3**	38.3	**34.2**	1.8	-
R9	45/35	47.4	45.6	25.0	43.6	**34.3**	33.0	**34.3**	0.6	-
R10	45/35	49.5	46.4	28.5	42.5	**37.5**	40.5	**37.4**	1.4	**2.5**
R11	45/35	49.5	46.8	27.1	42.6	28.5	41.2	28.1	1.8	-

*Noise limits shown include adjustments for influencing factors. Predicted noise levels shown in bold represent those that have been adjusted to include a 5 dB tonality penalty. Shading represents an exceedance of the assigned noise level.

Table 3: Compliance assessments for worst case day and night operations modelled

Residence	Noise limit	Scenario 2		Scenario 3		Scenario 4	
		Complies	Non-compliant wind directions	Complies	Non-compliant wind directions	Complies	Non-compliant wind directions
Day							
R2	46	No	NE, E – W	No	E, SE, S	Yes	
R8	45	No	N, NE, E	Yes		Yes	
R9	45	No	N, NE, E	Yes		Yes	
R10	45	No	NE, E, SE	Yes		Yes	
R11	45	No	NE, E, SE	Yes		Yes	
Night							
R10	35	Yes		No	N, NE - SE	No	N, NE - SE

Two of the 11 residences are landowners and therefore not considered sensitive receivers (R1 and R4; Figure 1). During construction, residences R1, R2, R6, R7, R8, R9, R10 and R11 are all expected to receive noise levels over 45dB(A) under certain wind conditions, though this is allowed for under the regulations. The highest noise level predicted by modelling is 49.5, experienced by R10 and R11, when winds are from the east.

Residences R1, R2, R8, R9, R10 and R11 were predicted to receive exceedances during daytime operations under scenario 2. R2 is predicted to also receive exceedances during daytime operations under scenario 3. Including penalties for tonality and adjustments for influencing factors, R2 is predicted to receive noise levels up to 9.7 dB over the assigned day time noise levels. R8 and R9 are predicted to receive noise levels up to 1.8 dB and 0.6 dB over the day time noise limit respectively, when winds are from the north, north east and east. R10 and R11 are expected to receive noise levels up to 1.4 dB and 1.8 dB over the day time noise limit respectively, when winds are from the north east, east and south east

Only one residence, R10, was predicted to receive noise levels in excess of the assigned night time level, when a penalty for tonality is applied. The maximum exceedance is predicted to be 2.5 dB, when winds are from the north to south east.

The highest daytime noise level predicted by modelling was approximately 50.7 dB(A) under south-easterly and southerly winds at residence R2. The noise level increases to 55.7 dB(A) when the tonality penalty is applied. A maximum night time noise level of approximately 32.5 dB(A) is predicted in northerly to easterly winds at R10. The noise level increases to 37.5 dB(A) when the tonality penalty is applied.

Wind speed and direction were found to have a big impact on the noise levels at the closest residential locations. The key source of noise during daytime operations is mobile earthmoving equipment.

5. MANAGEMENT

5.1. Site Design

Noise bunds have been integrated into the mine design around significant fixed noise emitting locations to reduce noise impacts from those locations. The noise bunds will be constructed from earthen material as appropriate material becomes available, and removed as that material is required for backfill. These noise bunds have been incorporated into noise modelling, are depicted in Figure 2 and include:

- A 10 m noise bund on the north, south and west sides of the concentrator area;
- A 10 m noise bund on the north-east and north-west of the screen plant;
- A 10 m noise bund on the south-west, north-west and north-east sides of the contractor's area;
- A 5 m noise bund on the north side of solar drying dam decant sump #1;
- A 5 m subsoil stockpile on the west side of solar drying dam decant sump #1;
- A 5 m noise bund on the south and west sides of the solar drying dam decant sump #2;

- A 5 m subsoil stockpile on the north side of solar drying dam decant sump #2; and
- Diesel dewatering pump will be enclosed in a specially designed enclosure to reduce noise emissions.

The in-pit hopper will be installed at the bottom of the mine pit. The pit walls then provide a noise screen.

5.2. Construction

Construction work will be conducted in accordance with Regulation 13 (Construction sites) of the Environmental Protection (Noise) Regulations 1997.

Heavy vehicle operation during construction will be restricted to between the hours of 6am and 7pm, 7 days per week. Heavy vehicle operation outside these hours will be limited to dust suppression where necessary. Low noise activities such as light vehicle movement, surveying, fencing, installation of fixed plant and servicing of equipment may be conducted outside the above hours provided that noise limits are met. The fixed plant will not be operating (with the exception of dewatering pumps, where necessary).

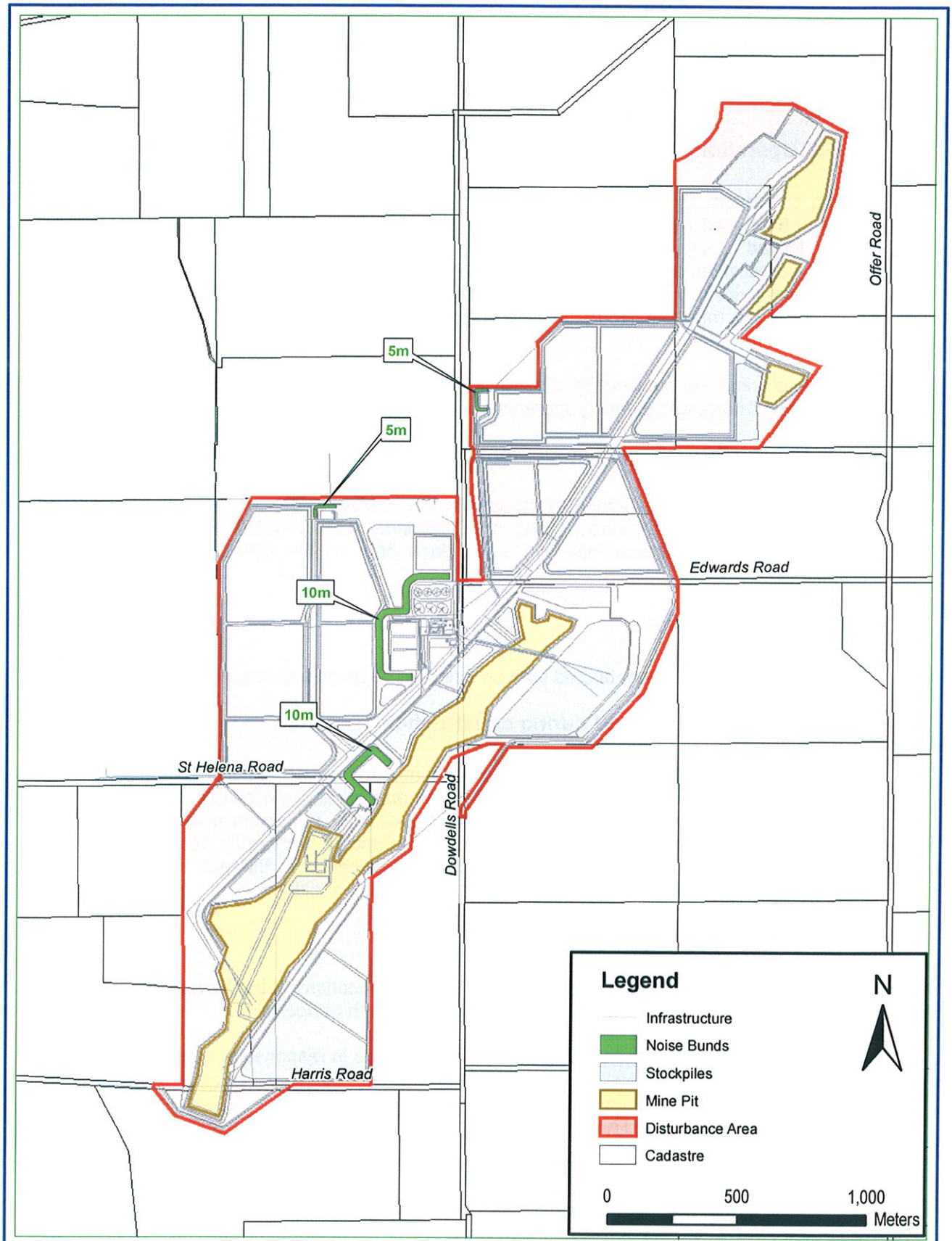
During construction, there will be exceedances to the noise regulations during day time operations. This is allowed for under section 13 of the noise regulations, with the provision that construction work is carried out in accordance with the control of environmental noise practices set out in section 6 of AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition sites. These practices include:

- Control of noise at source, by substitution, modification, use and siting of equipment and/or regular and effective maintenance
- Controlling the spread of noise, by distance and/or screening

Practices to be implemented during the construction phase include:

- Minimising the number of equipment operating in one area at a time
- Minimising the number of heavy vehicles starting up at once
- Ensuring the mobile machinery parking area (go-line) is as far away from residences as possible and noise bunds are constructed around the go-line as early as possible
- Equipment will be subject to regular maintenance.

These intermittent noises such as reversing beepers and horns have been recognised as having a high level of annoyance. As has been implemented at recent Iluka sites, all mobile machinery at the Burekup site will be required to have directional broadband white noise alarms rather than standard reversing beepers. The use of horns and alarms as an alert system will also be minimised, while maintaining safe operating standards, and start-up procedures to reduce the use of revving to warm up engines will be adopted where practicable.



BUREKUP

NOISE CONTROLS

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 23 Nov. 2007 DWG No: 178380 ver.00

FIGURE: 2

5.3. Operations

During operations, the majority of heavy vehicle activities will be restricted to between the hours of 6 am and 7 pm, 7 days per week. Heavy vehicle operation outside of these hours will be limited to supplying ore to the in-pit hopper and dust suppression where necessary. Low noise activities such as light vehicle movement, surveying, fencing, installation of fixed plant and servicing of equipment may be conducted outside the above hours provided that noise limits are met. All fixed plant and pumps will be operating continuously 24 hours per day.

The same principles outlined for construction, of controlling noise at source and controlling the spread of noise apply during operations.

5.4. Neighbour amenity agreements

Agreements are currently being developed with five nearby residences (R2, R8, R9, R10 and R11) predicted to receive noise levels in exceedance of the regulations under worst case conditions. These agreements will be in place prior to the operational mining phase commencing.

6. MONITORING

Noise monitoring will be conducted both on a regular basis and as required.

6.1. Monitoring pre and during construction

Monitoring will be conducted at selected locations before construction commences and during construction, with a portable sound logger and a handheld sound level meter. The logger will be set out at residences for periods of 1-2 days, to capture a range of times and conditions prior to work commencing. During construction, the logger will be set out for a period of 1-2 days at least twice at selected residences with the aim to capture noise measurements over a range of construction and weather conditions.

6.2. Monitoring during operations

Noise levels shall be monitored at selected monitoring locations at least every 6 months. The first operational monitoring will occur within the first month of operations.

Noise monitoring will be conducted on an as needs basis in response to operational changes and landowner queries.

7. COMMUNITY LIAISON

7.1. Community consultation

Iluka engages in a continuous consultation process for neighbours and the locally elected representatives and executives of the Shires in which it operates. This includes providing regular briefings, site tours, letters and newsletters on an ongoing and as required basis in order for these important stakeholders to be kept informed and for feedback on the operations to be sought.

Iluka regularly conducts detailed briefings with NGO groups on an operational and project level, and Burekup will be included as part of these briefings.

Iluka will share information regarding the mine with the wider community via Iluka's website and regular newsletters.

7.2. Complaints Procedure

Iluka has a well established community comment and complaints procedure, which is recognised by the community as being thorough and responsive.

Neighbours of the mine site will be provided with 24 hour contact cards providing the phone numbers of key Iluka operational personnel for Burekup.

All complaints are responded to in a timely manner, and it is aimed to resolve complaints where practical within three days.

Mine site operators and key Iluka staff have been trained in Iluka's comprehensive community complaints strategy.

8. CONTINGENCY PLANS

Where a noise issue is identified, contingency plans will be put in place to address the concern. These contingency actions and the triggers are outlined in Table 3.

Table 4: Trigger and Contingency Action

Trigger	Contingency action
Monitoring identifies noise in excess of acceptable levels at a residence	• undertake review of the dominant noise sources causing an issue at that residence; • discuss with the resident; • investigate management options such as outlined below.
Resident identifies noise in excess of acceptable levels at a residence	Initial response: • discussion with the resident to aid in identifying the source of the noise; • if required and if the noise is continuing at the time Iluka is alerted, visit residence to identify the source of the noise; and • where the noise source can be identified, modify operational activities to reduce the noise if practicable. Follow-up: • undertake review of the dominant noise sources causing an issue at that residence; • investigate management options such as outlined below
Employee or contractor identifies equipment that is noisier than usual	• report through Iluka's incident reporting system; • investigate cause of excessive noise and implement any remedial actions identified.

Any person identifies works being conducted which is not compliant with management action in section 5.1, which lead to unacceptable noise levels	• report through Iluka's incident reporting system; • complete actions generated.

Management options for reducing noise depend on the exact nature and impact of the noise, however may include:

- moving equipment to another area;
- changing to less noisy equipment if available and practicable;
- maintenance to reduce unusual noise;
- other engineering solutions; or
- cease problematic activity until weather conditions improve.

9. KEY MANAGEMENT ACTIONS

Table 5: Key management actions

Key Management Actions	Performance indicator
Operation of heavy earthmoving equipment for construction (excluding dust suppression) will be undertaken between 6 am and 7 pm seven days per week	Logbook
Equipment will be regularly maintained	Maintenance records
10 m noise bunds will be constructed around concentrator, screen plant and contractors area as modelled	Noise bunds in place
5 m noise bunds and subsoil stockpiles will be constructed around SDD decant sumps as modelled	Noise bunds in place
The in-pit hopper will be located at the base of the mine pit	Hopper in place
Agreements will be developed with R2, R8, R9, R10 and R11 before the commencement of the operational mining phase	Agreements in place
Noise monitoring will be conducted at selected monitoring locations before construction	Monitoring records
Noise monitoring will be conducted at selected monitoring locations at least twice during construction	Monitoring records
Noise monitoring will be conducted at selected monitoring locations at least every six months during operations, the first occurring within the first month of operations	Monitoring records

Where performance indicators are not being met, action will be undertaken to ensure the objective is met. These actions will include management response to ensure logbooks and maintenance records are completed, prioritising work directions to ensure bunds are constructed and not commencing operations until agreements are finalised.

10. REPORTING

A noise summary will be provided in the Annual Environment Report (AER).

The compliance report will be based around the items in the key management actions table and will provide evidence of compliance with the management plan, in the form of relevant monitoring data and other management records.

11. REVIEW AND REVISE

This management plan will be reviewed to assess its suitability, adequacy and effectiveness in meeting the set objectives annually or more frequently as deemed necessary by Iluka. Where necessary, the plan will be revised and revisions will be submitted to the DEC for approval.

12. DOCUMENT CONTROL

Revision	Reviews/Changes	Create Date
A	Initiation of First Draft	2 August 2007
B	Second Draft	26 September 2007
C	Internal comments incorporated	
D	Finalised for submission	25 November 2007

APPENDIX 4
Preliminary Rehabilitation Management Plan

ILUKA

Iluka Resources Limited

Preliminary Rehabilitation Management Plan

Burekup Mineral Sands Project

November 2007

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1. INTRODUCTION

This plan relates to the closure and rehabilitation of the proposed Burekup mine site. This plan has been developed in conjunction with the Environmental Protection Statement (EPS) impact assessment document. Implementation of this plan and compliance during operations is a commitment of the EPS document. This plan has been developed in accordance with EPA Guidance Statement no. 6: Rehabilitation of Terrestrial Ecosystems (EPA, 2006).

1.1. Purpose

The purpose of this plan is to define an acceptable rehabilitation objective, provide preliminary information on the approach that will be taken by Iluka to effect appropriate closure and rehabilitation of the Burekup mine site. More specifically this plan has been developed to achieve the following outcomes:

- summarise pre-mining environmental conditions relevant to rehabilitation;
- communicate the conceptual rehabilitated landscape at Burekup;
- identify the likely structures that will need to be removed and or rehabilitated at closure;
- assess the risks confronting rehabilitation; and
- identify rehabilitation completion criteria for agreement as a mechanism for the relinquishment of bonds.

2. OBJECTIVES

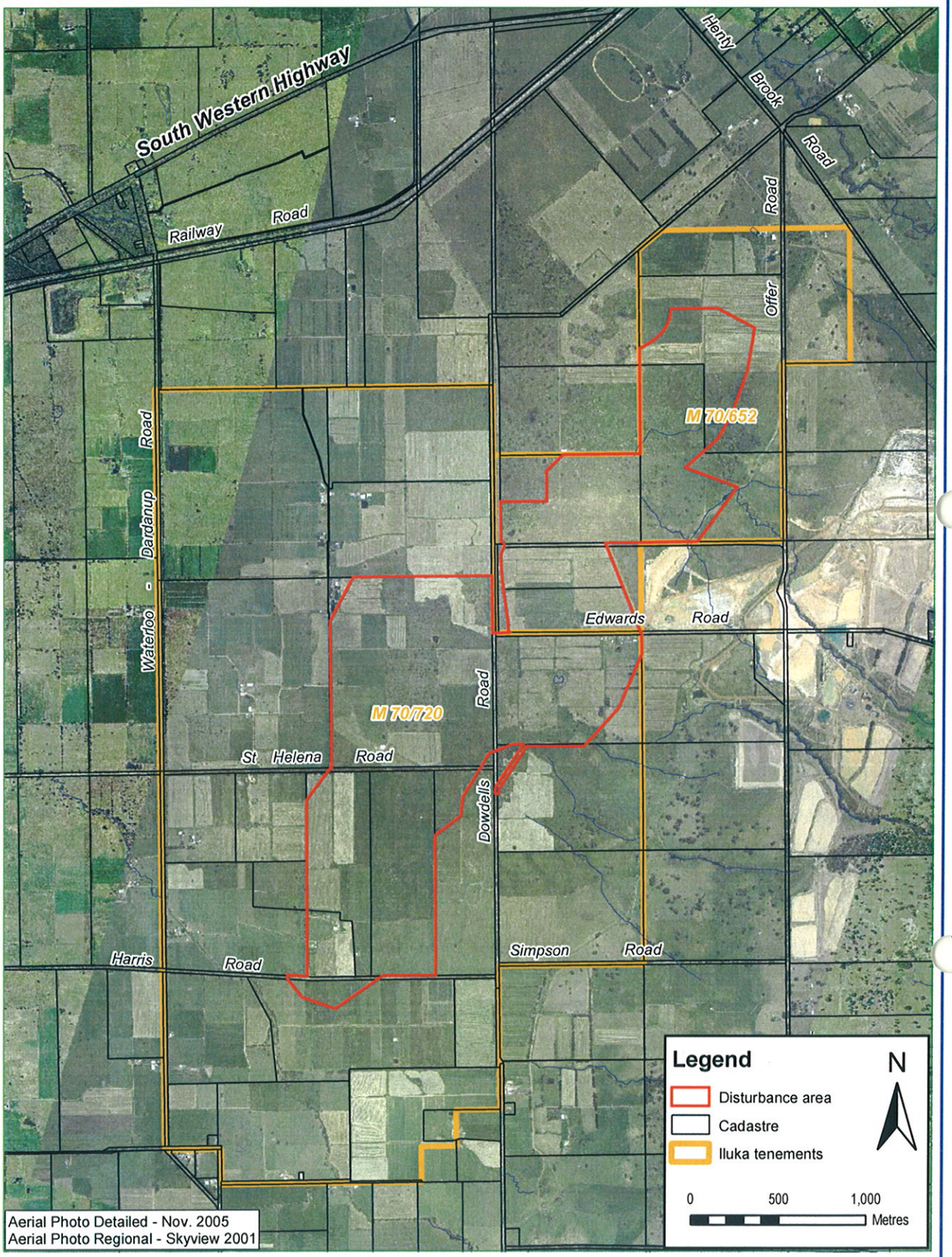
The primary objective of rehabilitation of the disturbed area is to return the land profile consistent with the surrounding topography and establish either productive agricultural land or native vegetation, considering past and future land uses.

Iluka's goals for the final restored landform will be to:

- achieve a post mining landform similar to the pre-mining condition and acceptable to the landowners;
- achieve soil profile, structure and infiltration characteristics which enable the land to be returned to its pre-mining land capability;
- reinstate surface drainage; and
- keep erosion to acceptable levels.

Standard objectives for rehabilitation as defined by the EPA (2006) and adopted by Iluka are:

- Safe, stable and resilient landforms and soils;
- Appropriate hydrology;
- Providing visual amenity, retaining heritage values and suitable for agreed land use;
- Resilient and self sustaining vegetation comprised of local provenance species;
- Reaching agreed numeric targets for vegetation recovery; and
- Comprising habitats capable of supporting all types of biodiversity.



BUREKUP

SITE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 170439 ver.03

FIGURE: 1

3. PRE-MINE ENVIRONMENT

The Burekup project is located approximately 11 km south east of Bunbury over mining tenements M70/652 and M70/720 in the Shire of Dardanup (Figure 1). The proposed Burekup mine site is located on agricultural land. As a result, the pre-mining environment is highly modified from the pre-European settlement landscape. The geology, landform, soils, hydrology and vegetation within the mine site are discussed below.

3.1. Geology

The Project is located within the Pinjarra Plain land system on the Swan Coastal Plain, at the footslopes of the Whicher Scarp within the Southern Perth Basin (Soil Water Consultants (SWC 2007a)). The sediments of the Perth Basin consist of coastal dune, beach, shallow marine and alluvial sediments from the Pleistocene to recent, namely the superficial Yoganup and Guildford formations. The superficial formations disconformably overly coarse, angular sand sediments of Mesozoic age. At Burekup, these Mesozoic sediments comprise the Leederville Formation, which is generally referred to as basement. Below the Leederville Formation lie the Bunbury Basalts, Yarragadee Formation and Cockleshell Gully Formation (Parsons Brinckerhoff 2007).

The Burekup deposit is at the base of the superficial formations and hence will be subjected to disturbance by mining. The Guildford Formation is generally present as a continuous unit over the site, ranging from 6 m thick in the centre of the deposit to 20 m thick to the west. The Yoganup Formation (where the ore is actually located) ranges from 1 m to 6 m thick across most of the orebody, with a maximum thickness of 11 m in the southwest (Parsons Brinckerhoff 2007). In the north of the site, the Yoganup Formation contains clay levels similar to Guildford Formation clay levels (N. Northcott, pers. comm.). The Leederville Formation is absent to the north of the site and to the west, over Bunbury Basalt. Basalt is not known to exist beneath the Burekup deposit (Parsons Brinckerhoff 2007).

3.2. Landform

The Project is located on the northern surface of the Ferguson River piedmont, an area of flat to gently undulating land with small localised rises separated by broad low-lying depressions (Wells 1989, cited in SWC 2007a). The depressions experience seasonal inundation and waterlogging. Very little height difference exists between the rises and low-lying depressions, however more pronounced dissection occurs along drainage lines on the eastern side of the Project. The surface elevation varies from 25 m AHD on the western side to 35 m AHD on the eastern side. The general aspect is northwest (SWC, 2007a). The Collie and Ferguson Rivers are located 6 km to the north and 3 km to the south of the Burekup site respectively and form the dominant river systems in the region. Henty Brook and Paradise Creek represent smaller systems, located approximately 3 km north and 350 m south of the site.

3.3. Soils

As the site occurs on the Pinjarra Plain, the soils consist primarily of poorly drained clayey soils of the Guildford Formation. A baseline soil survey conducted over the site identified four Soil Mapping Units (SMUs) at Burekup (SWC 2007a). The dominant soil type on the site consists of acidic yellow, grey and brown gradational earths and mottled duplex soils subject to inundation and waterlogging. Clayey soils on the eastern side of the site are overlain by shallow pale grey sand and sandy loam, forming a well defined duplex soil profile, facilitating perching and waterlogging near the surface (SWC, 2007a).

Soil Mapping Units

The soil mapping units mapped over the Burekup Project are shown in Figure 2 and described below.

SMU1: Uniform Brown Heavy Clay

This SMU occurs in two isolated areas within the site and likely represents the basal portion of remnant stream channels through the area (see Figure 2). The soil extends from the surface to depths of up to 4 m and is deposited directly onto the blue-grey sandy clay soils of the Guildford Formation.

The topsoil is structurally degraded, resulting in slaking and dispersion, causing the soils to hardset. The underlying brown clay soils are well structured and abundant roots occur throughout. This material is moderately saline with a relatively high sodicity and poor structural stability. The blue-grey sandy clay soils of the Guildford Formation occur beneath the brown clay and shows signs of shrink-swell properties.

SMU2: Gradational Pale Grey Sand – Yellow Sandy Loam

This SMU is restricted to areas of higher elevation in the northeast (see Figure 2). The surface soils consist of 10 to 40 cm of pale grey sand grading into a bright yellow to mottled yellow sandy loam at depth. These soils are not structurally degraded like those of SMU1. The surface soils exhibit a sandy texture with little clay and therefore are well drained and friable. There is a clear boundary between the surface sandy soils and the underlying blue-grey sandy clay soils of the Guildford Formation.

SMU3: Pale Grey – Brown Sandy Duplex

This SMU is isolated to the northeastern margin of the proposed main pit (see Figure 2). It consists of a pale grey – brown sand overlying the blue-grey sandy clay soils of the Guildford Formation with an abrupt textural boundary. The sandy surface soils have a very low water holding capacity and subsequently they become saturated in winter months with water perching on the clayey soil below, and drying rapidly in spring. The defined duplex boundary facilitates perching and subsequent lateral flow of water, which has implications for the formation of surrounding areas of inundation. It is likely that these soils have formed in depressions on the upper surface of the underlying Guildford Formation.

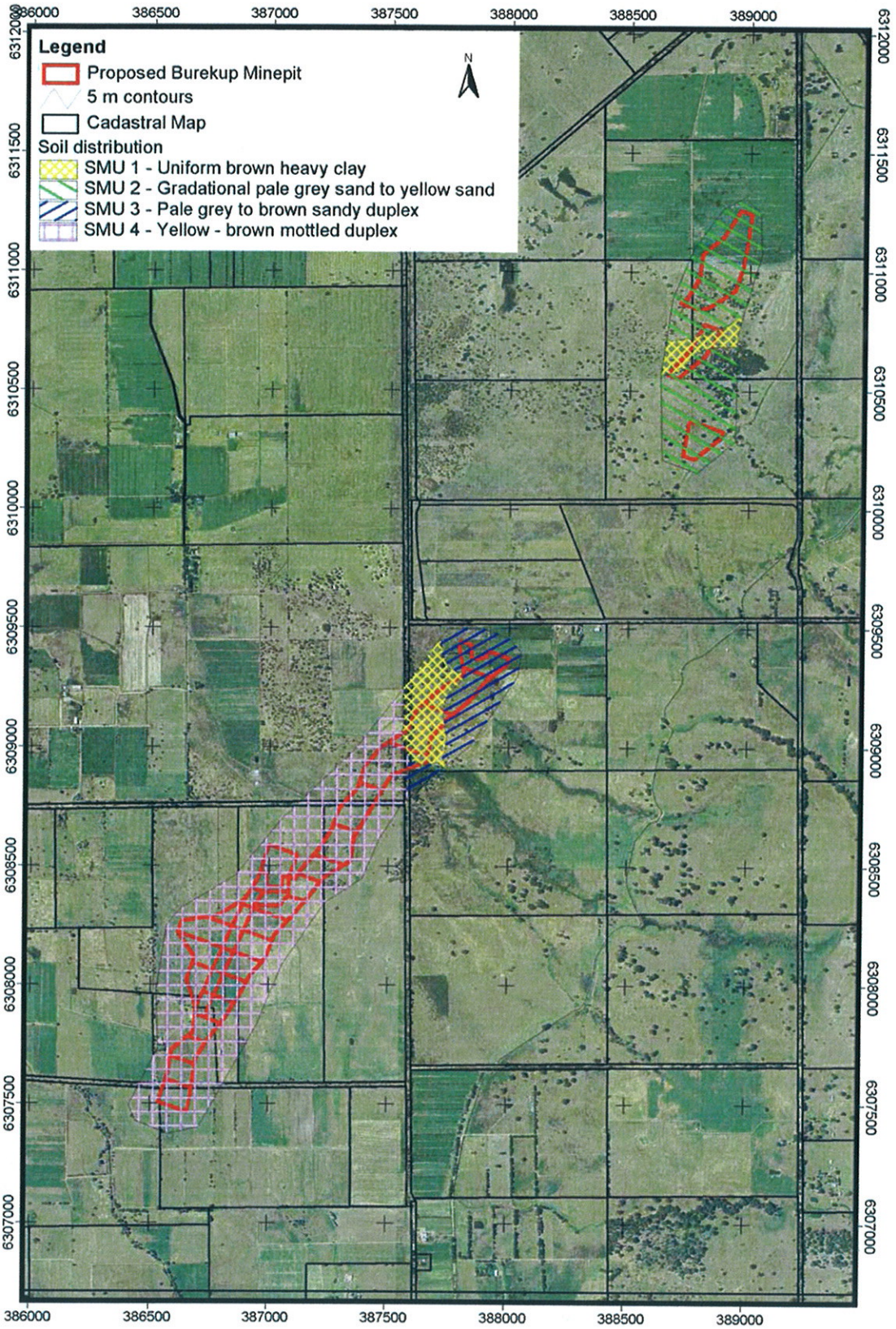
SMU4: Yellow – Brown Mottled Duplex

This is the most dominant SMU in the site (see Figure 2). The bright yellow to brownish orange surface soils overlying the Guildford Formation are coarser than those in SMU1 and therefore better drained. Again, the boundary between the surface soils and the Guildford Formation is abrupt, indicating a depositional, rather than pedogenic, mode of formation.

The topsoil has a sandy clay texture which is structurally sensitive. These soils slake rapidly when rewet and show moderate dispersion resulting in hardsetting. Cultivation of these soils is also likely to enhance hardsetting, and considerable shrink-swell properties are observed.

The subsoil consists of bright yellow sandy clay with a very good structure and firm crumb peds. It is less dispersive (due to iron oxides) with relatively high plant available water content.

It is important to note that the clayey Guildford Formation underlies all surface soils across the site. The Guildford clay remains unsaturated throughout the majority of the year, as evidenced by the extensive mottling and laterisation. Water movement through the clayey matrix is extremely slow, however preferential flow does occur through isolated coarse sandy lenses.



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Rev'd. by	AJH	02/05/07
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Iluka Resources Limited
BUREKUP MINESITE PRE-MINE SOIL SURVEY
SMU DISTRIBUTION

Figure 2

SWC

Acid Sulphate Soils

Acid sulphate soil studies indicate that no acid sulphate soils are present within the mine pit and consequently no PASS material will be directly disturbed by mining (i.e. excavated) at this site. Potential Acid Sulphate Soils (PASS) were located in the Leederville Formation underlying the proposed mine pit. No AASS is present at Burekup.

3.4. Land Capability

Ten separate pre-mine agricultural assessments were performed by John Wise Consultancy on 30 October 2006 for lots affected by the proposed mine. These independent assessments of the pre-mining land capability and pasture production will subsequently be used to benchmark the post mining productivity of rehabilitated land. All lots occurred within the Pinjarra Plain land system. Although the land tended to be poorly drained and suffer from winter waterlogging, it was generally productive for fodder crops and summer grazing.

3.5. Hydrology

The superficial groundwater aquifer at Burekup comprises of the Guildford Formation and Yoganup Formation. The superficial formations contain limited groundwater resources. Groundwater modelling indicates that the hydraulic head in the superficial aquifer is between 0.1 m and 6 m below ground level, with some surface areas being inundated during the winter months. Transmissivities range between 0.5 m^2/day to 79.1 m^2/day. The highest transmissivities represent the sandy zones of the Yoganup Formation. The high clay content of the Guildford Formation results in ponding during winter. Groundwater flow is generally toward the coast (north-west), mimicking the topography (Parsons Brinckerhoff 2007).

Below the superficial formations is the aquifer of the Leederville Formations. Hydraulic heads measured in piezometers screened in the Leederville aquifer are similar to those in the superficial aquifer. The transmissivity of the Leederville Formation ranges between 4.9 m^2/day to 46 m^2/day and also flows north-west, toward the coast. This aquifer is hydraulically isolated from the superficial aquifers in areas where a grey clay and silt horizon is present, however where this horizon is absent, there may be some connectivity between the formations, leading to upward leakage (Parsons Brinckerhoff 2007).

There are numerous agricultural drains and irrigation channels located within and near the Project (Figure 3). The Burekup area, including the Project, has in most part been classified as a multiple use wetland. One conservation wetland (UFI 2362) is located east of the Project. One resource enhancement wetland (UFI 2165) is located north of the Project (Figure 3).

3.6. Vegetation and Flora

Native vegetation

Vegetation within and surrounding the area of disturbance is described in detail in the Vegetation and Flora Management Plan. The area of disturbance is mainly cleared agricultural land. Nine vegetation communities have been described by Mattiske Consulting Pty Ltd (2006) (Figure 3) and rated using the Bush Forever condition rating system (Table 1). Of the nine communities surveyed, six occurred partly within the proposed disturbance area for the Project. Community C4 has dominant species similar to Threatened Ecological Community SCP 3a. This community occurs outside of the disturbance area, although is in a road reserve and not within the disturbance footprint of the Project.

Approximately 375 ha of land is proposed to be disturbed, of which a total of 0.5 ha was ranked as "very good" (condition 3) native vegetation. Approximately 3.2 ha was assessed as being in 'good' (Condition 4) and approximately 59 ha is 'degraded' vegetation (Condition 5). The

remaining area of potential disturbance, 312 ha, is cleared agricultural land described as 'completely degraded' (Condition 6) with isolated trees in paddocks. Within the areas mapped as condition five vegetation communities, large cultivated areas exist with no vegetation remaining. This is most prevalent within the E1 and M2 communities. These communities are 'parkland cleared', actively farmed areas, where trees remain, at very low densities. The area of actual clearing of condition 5 native vegetation is therefore considered to be significantly less than the 59 ha mapped and shown below.

Table 1: Disturbance to native vegetation at Burekup

Vegetation Code	Vegetation Description	Condition	Area in hectares
C1	Woodland of Corymbia calophylla – *Eucalyptus wandoo* over *Xanthhorrhoea preissii*, *Hypocalymma angustifolium* and weeds on sandy-loam soils.	4	0.5
C2	Woodland to forest of *Corymbia calophylla – Eucalyptus rudis – Melaleuca rhaphiophylla – Melaleuca preissiana* over weeds on loam soils.	3	0.1
		4	1.6
		5	1.3
C3	Low woodland of *Casuarina obesa* over *Melaleuca viminea* subsp. *viminea* and *Hakea varia* over *Chorizandra enodis* on sandy loam soils	4	0.4
		5	0.2
E1	Woodland of *Eucalyptus wandoo* over *Melaleuca rhaphiophylla* over pasture on loam soils	5	16.3
M1	Low woodland to forest of *Melaleuca rhaphiophylla* with emergent *Corymbia calophylla* and *Eucalyptus rudis* over pasture on loam soils	5	39.4
M2	Woodland of *Melaleuca preissiana*, with *Eucalyptus rudis* and *Corymbia calophylla* over *Melaleuca lateritia*, *Viminaria juncea*, *Acacia saligna* and *Hakea varia* over *Lepidosperma longitudinale* on clay-loam soils	3	0.4
		4	0.6
		5	1.6
		Total	62

Flora

In the flora and vegetation survey conducted in December 2005 and September 2007 by Mattiske Consulting Pty Ltd (2006; 2007), a total of 199 taxa (including subspecies and varieties) from 139 genera and 53 families was recorded within the Burekup study area. Representation was greatest among the Poaceae (28 taxa), followed by Papilionaceae (18 taxa), Myrtaceae (16 taxa), Cyperaceae (15 taxa) and Mimosaceae (11 taxa). 24 Poaceae, 7 Papilionaceae and 3 Cyperaceae were weed species. The families with the highest native representation were Myrtaceae (16 species), Cyperaceae (12 species) and Mimosaceae (10 species).

No Declared Rare, Threatened or Priority Flora were located during flora surveys although it is noted that one Priority 4 taxon *Aponogeton hexatepalus* has previously been found on the Project area.

The EPA has previously noted that the Burekup Project contains the following species of significance:

- the southernmost known occurrence of *Casuarina obesa* on the eastern side of the Swan Coastal Plain;
- one of the most extensive stands of mixed age *Eucalytpus wandoo* that far South on the Pinjarra Plain; and

- *Corymbia haemotoxylon* located within the study area which could be considered a disjunct and significant population.

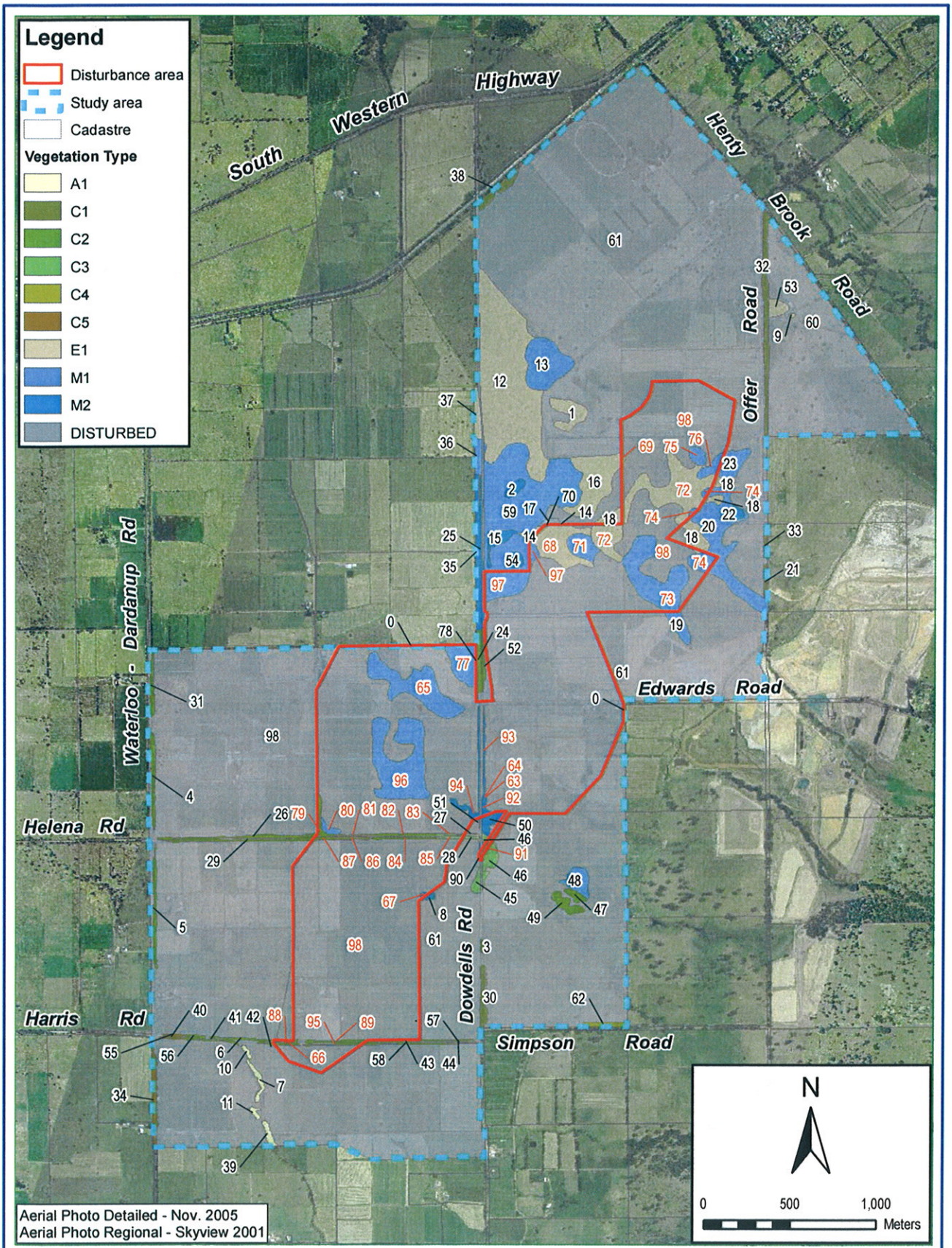
Introduced Species

Of the 86 introduced or weed taxa recorded in the flora surveys (Mattiske Consulting Pty Ltd 2006 and 2007), four are Declared Plants pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976*. They are:

- *Acacia dealbata* (Silver Wattle) P1, P2;
- *Rubus fruticosus* agg. (Blackberry) P1, P4;
- *Asparagus asparagoides* (Bridal creeper) P1; and
- *Gomphocarpus fruticosus* (Narrowleaf Cotton Bush) P1, P4.

In accordance with the *Agriculture and Related Resources Protection Act 1976,* the aforementioned Declared Plants must be managed according to their classification:

- P1: "Prohibits movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder";
- P2: "Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery"; and
- P4: "Prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants".



BUREKUP

VEGETATION TYPE

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:30,000 (A4) DATE: 23 Nov. 2007 DWG No: 176739 ver.01

FIGURE: 3

4. REHABILITATION RISK ASSESSMENT

4.1. Significant Limitations to Rehabilitation

Table 7 from *Guidance for the Assessment of Environmental Factors no. 6: Rehabilitation of Terrestrial Ecosystems* (EPA, 2006), was used to determine the main limitations to pasture rehabilitation and native vegetation rehabilitation at Burekup.

The main limitations to the success of rehabilitation of disturbed land back to productive pasture are:

- Changes to soils and soil profile
- Landform stability
- Changed hydrology
- Climatic unpredictability

The main limitations to the success of rehabilitation of native vegetation are:

- Changes to soils and soil profile
- Environmental weeds
- Grazing by pests or livestock
- Climatic unpredictability

Potential impacts and management of these issues is discussed further in section 4.2 and section 9.

4.2. Pasture Rehabilitation: Potential Impacts & Management

Changes to Soil and Soil Profile

Potential Impacts:

Changed soils or soil profiles may alter the capability of the rehabilitated land to support agricultural pastures. This may then affect the quantity and seasonal distribution of pasture production. However, assessments of pasture productivity need to be considered in the context of the prevailing management regime.

Management Strategy:

The management strategy for soil profile reconstruction in pasture areas will rely primarily on the identification and retention of specific soil materials (including topsoil) identified in the soil survey as being important to pasture productivity (see section 9). Given appropriate management, the preservation and subsequent return of these soil materials to the same position in the profile, will reinstate the potential for productive agricultural pastures.

Landform Stability

Potential Impacts:

Until the restored landform is revegetated with pasture species, the returned soils are potentially vulnerable to erosion by wind or water.

Management Strategy:

The risk of erosion from water will be relatively low due to the very low relief present at Burekup. Consequently no special management strategies will be required for water erosion.

Potential erosion of soils by wind during and after the completion of the landform restoration process is an important issue requiring management at all of Iluka's mine sites. A water cart is used to suppress dust in active working areas. A small amount of clay slurry is added to the

water cart to provide longer lasting (several months) stabilisation in areas where soil return is complete.

Changes to Hydrology

Potential Impacts:

Changes to hydrology may affect downstream users by either increasing or reducing the volume of flow.

Management Strategy:

The pre-mining drainage network consists of agricultural farm drains and irrigation channels. During mining and early rehabilitation, the site will have isolated drainage with a controlled release point into an agricultural drain. Drainage will be re-instated comparable to pre-mining conditions once rehabilitation is at an advanced stage.

Climate Unpredictability

Potential Impacts:

Climate unpredictability may impact on the rehabilitation of pasture due to either excessive or inadequate rainfall at certain times of the year.

Excessive rainfall will reduce the trafficability of soils requiring handling, thus causing delays to landform restoration.

Inadequate rainfall will allow soil return to be completed; however subsequent seeding with pasture may then fail. This is an ongoing risk experienced by most graziers.

Management Strategy:

Where excessive rainfall is experienced, a delay to rehabilitation may be unavoidable. If necessary, the rehabilitation area would be seeded the following year.

Where inadequate rainfall is experienced, pasture establishment will unavoidably be poor. The rehabilitated area will be stabilised with a dilute clay slurry if necessary and reseeded the following year.

4.3. Native Vegetation Rehabilitation: Potential Impacts & Management

Changes to Soil Profile

Potential Risks:

The native vegetation to be established during rehabilitation within the Burekup disturbance area may be impacted by changes to the texture and structure of soils if they are not returned in the appropriate order.

The significance of this change in floristic composition will tend to be proportional to the change in the reconstructed soil profiles relative to pre-mining conditions. Where changes to the soils are slight, then the vegetation type may change slightly, but the same range of species for the targeted vegetation community are still expected to be present. By contrast, significant adverse alteration of the soil profile that does not reflect the Pinjarra Plain, could result in conditions that are not conducive to the establishment of key species for the targeted vegetation community.

Management strategy:

Reinstate surface and subsurface soil characteristics that replicate pre-mining disturbance. Key aspects of the management strategy for soil profile reconstruction in native vegetation areas include:

- retention of the existing subsoil layer;

- selection of backfill materials with similar physical and chemical properties to the existing soils and no adverse properties; and
- revegetate areas on undisturbed soils.

Environmental Weeds

Potential Impacts:

The area has an existing high weed load, however additional weeds could be introduced if incorrect species were planted. Machinery and equipment carrying foreign soil could also introduce weeds into the area.

Management Strategy:

Ensure that all machinery and equipment used for native vegetation rehabilitation is in a clean condition. Control emergent weeds before topsoil stripping, in stockpiles and in rehabilitation as required. Any occurrence of declared weed species will be controlled as required.

Grazing

Potential impacts:

Livestock entering the native vegetation rehabilitation may damage planted seedlings by trampling or grazing.

Management Strategy:

The native vegetation areas will be fenced to exclude livestock.

Climate Unpredictability

Potential Risks:

Climate unpredictability may impact on the success of rehabilitation due to either excessive or inadequate rainfall at certain times of the year.

Inadequate rainfall, or drought, may result in high mortality rates in planted seedlings due to moisture stress.

Management Strategy:

Both flooding and drought are natural phenomena, which can not be controlled by Iluka. If high mortalities are experienced due to climatic conditions, then the losses will be replaced by infill planting the following year.

5. SITE DEVELOPMENT

This section describes the activities that have taken place to date and will continue to take place throughout the life of the mine, in order to ensure that rehabilitation is as successful as possible.

5.1. Infrastructure

All farm infrastructure such as fences and livestock water supplies within the disturbance area shall be decommissioned prior topsoil stripping. To facilitate its correct reinstatement, the position of this infrastructure will be surveyed prior to its removal.

5.2. Vegetation clearing

A maximum of 3.6 ha of native vegetation with a condition rating of 4 or better will be cleared. A further 59 ha of degraded vegetation (condition rating 5) is also expected to be cleared. Clearing of native vegetation is to be conducted on an as-needs only basis, to minimise the amount of clearing conducted and period of impact. Cleared timber that cannot effectively be used for another purpose will be burnt.

5.3. Soil removal and stockpiling

Topsoil, subsoils and overburden are removed and stockpiled separately, using suitable earthmoving machinery (scrapers, excavators and trucks, and carrygraders) to facilitate subsequent landform re-establishment.

Topsoil

Two distinct topsoil materials are present at Burekup:

- loamy topsoil which occurs within Soil Management Unit (SMU) 1 and SMU 4; and
- sandy topsoil, which occurs within SMU 2 and SMU 3.

Loamy topsoil is structurally degraded sandy clay which rapidly breaks down to a fine clay following disturbance. This leads to a high potential for dust generation and the material must be handled appropriately. Loamy topsoil should be stockpiled separately from sandy topsoil.

To assist in restoring the pre-mine productivity, each topsoil type will be returned to its pre-mine landform position post mining.

Topsoil stockpiles will have a maximum height of 3 m, in order to maintain the soil's biological activity and retention of nutrient sources. Topsoil stockpiles stabilised with a grass cover.

Subsoil

Three distinct subsoil materials are present:

- sandy subsoil, which occurs within SMU 3;
- loamy subsoil, which occurs within SMU 2; and
- clayey subsoil, which occurs within SMU 1 and SMU 4.

Sandy subsoils are not structurally sensitive and can be handled easily, with no restrictions, during mining and rehabilitation.

Loamy subsoil have optimal soil structural and water holding properties. They are structurally sensitive to disturbance and should not be handled when either too wet or too dry.

Clayey subsoil includes the yellow-brown mottled sandy clay and the brown clay. It has adverse properties of high clay content and salinity/sodicity. However, its high plant available moisture content and existing utilisation by plant roots suggest that it will be beneficial to rehabilitation if handled correctly. Therefore it will be removed and stockpiled separately from the underlying overburden material.

Overburden

Overburden is a blue grey sandy clay material which exhibits adverse properties (high clay, salinity and sodicity). Overburden will be removed and stockpiled separately, then returned and overlain by subsoil and topsoil.

Overburden will be used to construct the noise bunds, haul roads and contractors heavy equipment parking area. A layer of sand is laid down between in-situ subsoil and stockpiled material to provide clear definition of the material boundary.

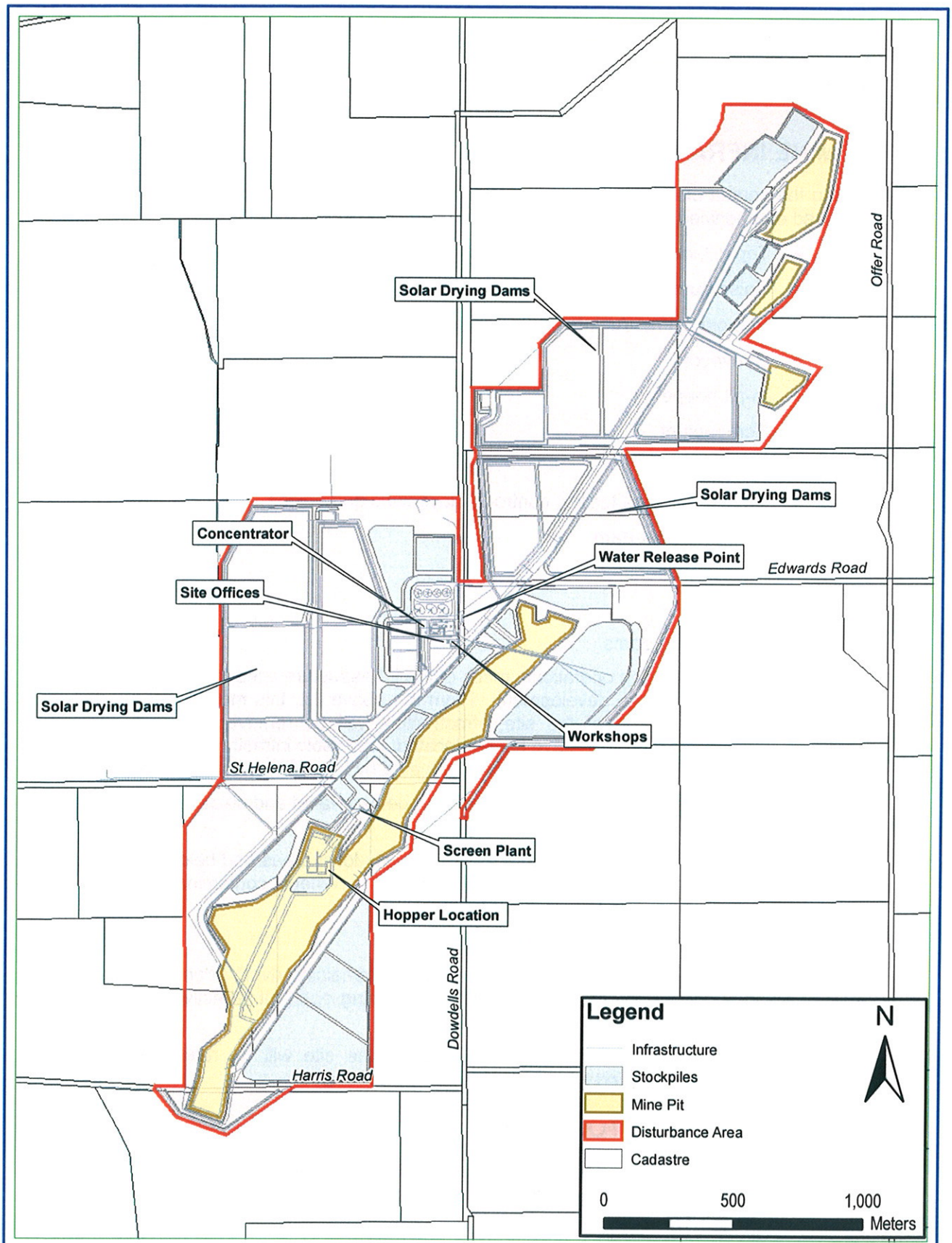
6. MINING

The orebody will be mined utilising open cut, dry mining techniques. The mining method will be similar to other South West sites. Overburden will be stockpiled as well as being used in the construction of noise bunds. Ore will be excavated and hauled to the in-pit hopper, then conveyed to the screen plant. Oversize is removed and the ore is then pumped to the wet concentrator to separate clay fines and sand tails from the Heavy Mineral Concentrate (HMC) (Figure 4). Solar drying dams will be used for drying of clay fines. Dewatering of the mine pit will be required to allow dry mining to occur. All water will be directed to dams for re-use in the process.

Sand tails, clay fines, overburden, subsoils and topsoils will be replaced in mined-out pits and rehabilitated to a final landform as described in Section 8.

HMC will be stockpiled a prior to being transported via trucks to Capel for further processing.

Construction works are scheduled to commence in last quarter 2008 with production commencing in first quarter 2009. The deposit is expected to take approximately 1.5 years to mine. Decommissioning and rehabilitation will take approximately 2 years to complete, with rehabilitation maintenance continuing for approximately 3 years.



BUREKUP

MINE PLAN

ILUKA

ORIG: S.Jones DRAWN: T.L.G SCALE: 1:20,000 (A4) DATE: 14 Nov. 2007 DWG No: 178372 ver.00

FIGURE: 4

7. MINE INFRASTRUCTURE DECOMMISSIONING

During the course of mining, there are a number of structures developed that will need to be removed or otherwise rehabilitated to implement effective closure including:

- Topsoil, overburden and subsoil stockpiles (discussed further in section 8).
- Noise bunds
- Pumping infrastructure and pipelines
- Conveyors
- In-pit hopper
- Screenplant
- Concentrator
- Workshops, fuel facility, contractor laydowns and offices
- Process water dam
- Internal powerlines
- Pits
- Solar drying dams

As part of Iluka's continuing operations, much of the infrastructure used for mining is relocated to the next project for mine development. From the above list, this means that shortly after closure, a large proportion of the site infrastructure will be removed or dismantled and removed. Once items for re-use have been relocated, recyclable infrastructure will be removed by a salvage contractor leaving a landscape dominated by foundations and open areas.

Inert or structural waste that cannot be recycled will be excavated and placed in the base of the remaining open pit.

The foundations around workshops, refuelling areas, laydown areas and below fixed plant will be investigated for the potential of contamination. Where contaminated material is encountered, it will be excavated for remediation.

Internal (Iluka owned) powerlines will be removed.

Material stored within the solar drying dams and any remaining overburden stockpiled or as part of noise bunds will be transferred into the remaining open pit, effectively removing the solar drying dams as structures in the landscape

After completion of decommissioning infrastructure, the site will be ready to commence rehabilitation on the remaining open area.

8. LANDFORM RESTORATION

After mining, the void will be backfilled with sand and clay tails and overburden. To ensure the reinstatement of the Guilford clay within the plant root zone, overburden will be returned to a design surface.

Topsoil and subsoil replacement depths are currently estimated from pre-mining test pits. Exact volumes and depths replaced will be dependent upon realised stockpile volumes. The topsoil and subsoil balances will be regularly reviewed to ensure appropriate final topsoil and subsoil replacement depths.

The final surface design will be similar to the pre-mining surface design with minor undulations and erosional features smoothed out.

It is preferable to utilise carry-graders for topsoil and subsoil replacement as they allow a more accurate final land surface and lower compaction of soil compared to scrapers

Ripping of rehabilitated land lowers soil compaction and bulk density and increases water infiltration. This is beneficial in the control of erosion as increased infiltration subsequently reduces the intensity of any surface water runoff.

To alleviate any compaction caused by the movement of heavy machinery, all mined areas will be ripped. Ripping requirements will be tailored to suit specific rehabilitation areas. In native rehabilitation areas, deep ripping may be required. In pastured rehabilitation areas, less aggressive ripping may be prescribed to avoid adversely impacting the final land surface or the soil profile.

In areas of native vegetation rehabilitation, the timing of deep ripping can influence seedling regeneration. Ward and Koch (1999) observed that deep ripping after topsoil spreading could reduce plant densities by 40-60% due to burial effects. Therefore deep ripping will be implemented after the replacement of subsoil, but prior to replacement of the topsoil.

9. PASTURE REHABILITATION

The Burekup mine site will be rehabilitated using similar methods to other operations in the South West.

9.1. Pasture Establishment

Iluka has extensive experience in rehabilitating farmland on the Swan Coastal Plain. Procedures for re-establishment of agricultural land at Burekup will follow those currently used at other Iluka Southwest mine sites. The focus of the program will be to rapidly stabilise restored landforms with agricultural pastures. Subject to landowner agreements and agronomic advice, a clover-ryegrass mixture will be sown and fertilised in autumn to ensure a vigorous re-establishment of the pasture.

The methodology is summarised broadly below:

- application of lime at a rate determined via soil testing and agronomic advice;
- stickpicking to remove excessive quantities of large sticks and roots in the returned topsoil;
- seedbed preparation using a combination of secondary tillage implements (e.g. offset discs, scarifier, drag and harrows);
- application of fertiliser, for which the type, rate and number of applications will be determined via soil testing and agronomic advice.
- application of seed mix consisting of sub clover and ryegrass varieties; and
- after seeding, the area is rolled to provide a firm seed bed for pasture establishment.

9.2. Pasture Management and Maintenance

After pastures are established, they will be continually managed by Iluka's rehabilitation personnel. The primary aspects requiring management are: grazing, weed and pest control, and fertiliser application.

Grazing

In the first spring after sowing, the primary objective is to develop a stable, productive soil profile by encouraging proliferation of pasture roots and soil biota. Pasture will be grazed lightly to promote tillering of ryegrass, a healthy component of clover, and to discourage pasture weeds (eg. capeweed) from attaining dominance.

In subsequent years, it is expected that with appropriate management, pasture productivity will be comparable to other pastures in the locality. Grazing intensity will be gradually increased to levels considered appropriate for the district and seasonal conditions.

Weed and Pest Control

Weed control will primarily be achieved by ensuring pasture species are appropriately grazed such that they out-compete pasture weeds. Pastures will be monitored for problem weeds and pests. Where warranted, weeds will be controlled via herbicide application. Similarly, where warranted, pests such as red-legged earth mite will be controlled via insecticide application.

Invasive weeds or Declared Plants such as Silver Wattle, Blackberry, Bridal Creeper and Narrowleaf Cotton Bush will require spot spraying with a suitable herbicide should they occur in rehabilitated pasture.

Weed control procedures will follow normal agricultural practices, with agronomic advice sought where necessary.

Fertiliser

Pastures will be fertilised annually as part of an ongoing maintenance programme. The type, rate and number of fertiliser applications will be determined via soil testing and agronomic advice.

9.3. Post-mine Infrastructure

As a minimum, the pre-mining infrastructure will be reinstated, unless otherwise agreed with the landowner. Inclusion of additional infrastructure will be a commercial negotiation between landowners and Iluka.

Land layouts will be developed in consultation with landowners and will include surface design, fencing, drain locations, stock water points and farm roads required by respective landowners.

10. NATIVE VEGETATION REHABILITATION

The native rehabilitation programme will revegetate approximately 3.6 ha of native vegetation to condition rating 4 or better as identified in Table 2. Iluka will also rehabilitate areas of land to condition rating 5 which will involve establishment of pasture and an overstorey for the community types in Table 2). The number of trees cleared will be counted and that number, plus 20 % will be planted. This will result in the project having a significant net environmental benefit. The disturbance area will be revegetated from a combination of the topsoil seed store with direct seeding and planted seedlings.

Table 2: Condition 3 and 4 Native Vegetation Rehabilitation

Veg type	Rehabilitation (condition 3)	Rehabilitation (Condition 4)	Total
C1	-	0.5	0.5
C2	0.1	1.6	1.7
C3	-	0.4	0.4

Veg type	Rehabilitation (condition 3)	Rehabilitation (Condition 4)	Total
M2	0.4	0.6	1.0
Total	0.5	3.1	3.6

Table 3: Condition 5 Native veg rehabilitation

Veg type	Planting (Condition 5)
C2	Trees removed plus 20%
C3	Trees removed plus 20%
E1/M1	Trees removed plus 20%
M2	Trees removed plus 20%

10.1. Direct Seeding

Revegetation of the site will include those species that were recorded in baseline surveys.

Prior to direct seeding, seed shall undergo the appropriate treatments required to break dormancy and improve germination rates. The treatments could include smoking, freezing, boiling or scarifying.

To ensure an even coverage, the seed will be combined with vermiculate and then spread by machine across the site.

10.2. Seedling Planting

Seedlings shall be propagated from seed, cuttings or tissue culture. The species to be planted as seedlings are likely to be predominantly overstorey or keystone species, supplemented by recalcitrant species.

10.3. Fertiliser

Native vegetation is typically adapted to environmental conditions of low nutrient availability. To reduce the risk of competition from weeds and pasture species from adjacent areas, granular fertilisers will be spread at low rates.

Slow release fertiliser tablets will be applied with planted seedlings. To reduce their access by weeds, these tablets will be inserted below the soil surface adjacent to the seedlings.

10.4. Fencing

The areas of revegetation will be fenced before seeding to provide protection for young plants from livestock.

10.5. Maintenance

Maintenance of the rehabilitated areas will be required until relinquishment of the mining tenement to ensure the continued performance towards the objective. This will predominantly consist of weed control and pest control, the latter involving maintenance of perimeter fencing and/or baiting.

11. KEY REHABILITATION ACTION SUMMARY

The key rehabilitation actions described in sections 7, 8, 9 and 10 are summarised in Table 4 below.

Table 4: Key Rehabilitation Action Summary

Phase/Factor	Action	Timing	Performance criteria	Evidence
Site Development				
Vegetation clearing	A maximum of 3.6 ha of native vegetation at condition rating 4 or better will be cleared	Prior to and during mining	No more than 3.6 ha of native vegetation at condition rating 4 or better cleared	Survey; aerial photography
Vegetation clearing	Salvage as much timber as possible	Prior to and during mining	Landowner satisfied with extent of salvage	Landowner advice
Soil removal	Remove and stockpile topsoil, subsoil and overburden separately	Prior to and during mining	Soil materials in separate stockpiles	Visual assessment
Stockpiling	Stockpile topsoil to max 2 m	Prior to and during mining	Topsoil stockpiles max 3 m	Surveyed height of topsoil stockpiles
Mining and Landform Restoration				
Planning	Survey final stockpile volumes	Prior to landform restoration	Landform meets design profile	Survey files
Backfill	Return overburden	During landform restoration	Overburden replaced to design	Survey / test pits
Soil profile return	Return subsoil and topsoil	During landform restoration	Subsoil and topsoil replaced to design	Survey / test pits
Surface earthworks	Additional treatments (eg. ripping)	During landform restoration	Additional treatments conducted as required	Contractor log books
Surface earthworks	Reinstate drainage	After landform restoration	Drainage reinstated	Photos
Pasture Rehabilitation				
Planning	Develop site layouts in consultation with landowners.	Prior to rehabilitation	Layouts acceptable to landowners	Layouts signed by landowners
Pasture establishment	Apply lime	During rehabilitation (autumn)	Application as per agronomic advice	Documentation of advice and materials invoice
Pasture establishment	Prepare seedbed	During rehabilitation (autumn)	Implementation of normal agricultural practices	Photo
Pasture establishment	Clover-ryegrass mixture sown and fertilised	During rehabilitation (autumn)	Application as per agronomic advice	Documentation of advice and materials invoice
Monitoring	Monitor pasture production	For at least 3 years after mining	Monthly monitoring	Pasture monitoring records
Grazing	Pasture will be grazed lightly	First spring after sowing	Healthy clover component and low level of pasture weeds	Pasture monitoring records
Grazing	Gradually increase grazing intensity to levels considered appropriate for the district and seasonal conditions.	For at least 3 years after mining	Pasture productivity typical of the locality	Pasture monitoring records

Phase/Factor	Action	Timing	Performance criteria	Evidence
Weed control	Ensure pastures appropriately grazed	For at least 3 years after mining	Low level pasture weeds	Pasture monitoring records
Weed control	Control problem weeds via herbicide application where warranted	For at least 3 years after mining	Low level pasture weeds and declared weeds	Pasture monitoring records
Pest control	Control pests via insecticide application where warranted	For at least 3 years after mining	Low level pests	Pasture monitoring records
Fertiliser	Fertilised annually.	For at least 3 years after mining	Application as per agronomic advice	Documentation of advice and materials invoice
Native Vegetation Rehabilitation				
Seeding and Planting	Seed and plant species that reflect the pre-disturbance vegetation communities	During Rehabilitation	Appropriate species in rehabilitation	Visual assessment/photos
Weed and pest control	Control weeds and pests as required	Prior to and during Rehabilitation	Reduction in weed and pest abundance	Visual assessment/photos
Maintenance	Infill plant where required, including GDEs	For approximately 3 years after mining	Areas of poor or impacted vegetation ameliorated	Visual assessment/photos
Maintenance	Maintain fences	For approximately 3 years after mining	Fences in serviceable condition	Visual assessment
Monitoring	Monitor species recruitment	For approximately 3 years after mining	Annual monitoring	Rehabilitation monitoring reports

12. MONITORING METHODOLOGY

The land will be monitored and maintained for approximately three years following completion of mining.

12.1. Pasture Rehabilitation

When Iluka considers the pasture rehabilitation is complete, an independent agricultural consultant will be engaged to develop a post-mining agricultural productivity report. This report will integrate the results of monitoring for aspects described below and will verify whether pre-mining productivity levels have been met and are considered sustainable.

Landform

During landform restoration, visual inspections of work in progress will be conducted routinely by rehabilitation staff to ensure adherence to correct procedures.

After restoration of the landform, the disturbed area will be surveyed and a map produced showing 0.5 m contour intervals. Monitoring points will also be established to enable the assessment of land stability three years after completion.

Soil

During landform restoration, visual inspections of work in progress will be conducted routinely by rehabilitation staff to ensure that soil materials are returned to the correct position, as per criteria prescribed in the Implementation Plan.

In the first year of rehabilitation, preliminary soil pits may be excavated to allow early confirmation of the soil profile and identification of any limiting factors such as compaction. Early identification of such factors then allows remedial activities such as ripping to be performed in a timely manner.

The final post-mining assessment of the rehabilitated soil profile will be performed by a suitably experienced soil scientist. This assessment will not be performed until approximately 3 years after pasture establishment, so that pasture root distribution through the profile may be assessed.

Assessment of the post-mining soil profile will utilise similar methods to the pre-mining soil survey. Pit excavations will be excavated to a depth of 2 m. The soil profile within the pit will be recorded, with all soil horizons described and their location within the profile measured. Similar physical and chemical parameters assessed in the pre-mining survey will be reassessed within each soil horizon

The results of the soils assessment will be presented to DoIR in a final Post-Mining Soils Assessment Report.

Pasture productivity

While rehabilitated land is being maintained by Iluka, visual inspections of pasture growth will be conducted routinely by rehabilitation staff to ensure appropriate management of factors discussed in Section 9.2.

Pasture productivity monitoring will be conducted monthly during the growing season to measure total dry matter pasture production and the distribution of pasture and weed species. Methods currently used by Iluka for monitoring of existing rehabilitated sites will be extended to the Burekup site. These methods include a combination of pasture cuts, rising plate meter measurements, and ground cover scores.

12.2. Native Vegetation

Visual inspections of the native vegetation rehabilitation will be conducted routinely by rehabilitation staff to gauge the success of rehabilitation and determine when maintenance activities are required.

In addition, fixed photographic monitoring sites will be established within the area to provide documentary evidence of the outcomes of rehabilitation.

Photographic monitoring will be conducted annually during spring and will include the recording of native and introduced species presence within the photo frame. Evidence of damage by pests will also be recorded.

Annual monitoring will occur in the first three years of rehabilitation when the majority of works are undertaken. Following this, monitoring is likely to be decreased to intervals of 2-3 years or more.

13. REHABILITATION COMPLETION CRITERIA

Completion criteria need to be developed to determine when rehabilitation of the disturbance area at Burekup can be agreed to be complete. An approved set of completion criteria will be

used as a basis for assessing this completion. Iluka will be required to be in compliance with these criteria before bonds and mining tenements can be relinquished by the State.

Completion criteria are indicated in Table 5. These criteria reflect current technology and best practice rehabilitation methods, but will be subject to periodic review in consultation with relevant stakeholders. Amendments to the criteria will be subject to regulatory approval.

Table 5: Completion Criteria for Burekup

CRITERIA	MEASURE/ TARGET	EVIDENCE	CORRECTIVE ACTION
Pasture Rehabilitation			
Restore landform as soon as practicable	Soil profile restored within 1 year post mining	Annual inspection by government agencies	Restore soil profile as soon as is practicable
Restore vegetative cover as soon as practicable	Pasture re-established within 1 year after completion of backfill	Annual inspection by government agencies	Re-establish pasture as soon as is practicable
Mined land will be returned to the pre-mining agricultural productivity	Pre-mining productivity levels achieved and considered sustainable (by independent assessment)	Post-mining Agricultural Productivity Report	Review requirements for remedial action in consultation with regulatory agencies
Native Vegetation Rehabilitation			
Achieve a stable, non-eroding landform that can support native vegetation	Soil profile design achieved and after 3 years no significant limitations to native vegetation occur that were not present pre-mining	Final Post-Mining Soils Assessment Report	Review requirements for remedial action in consultation with regulatory agencies
The species diversity of native vegetation is comparable with pre-mining levels	Quantitative targets to be set in Final Closure and Rehabilitation Plan	Photographic monitoring, plot monitoring	Infill plant further species as required
Livestock excluded from the native vegetation rehabilitation areas	Fencing restricts stock access to access points	Annual inspection by government agencies	Maintain fences

14. REVIEW AND REVISION

This Preliminary Closure and Rehabilitation Plan is a live document that will be subject to continual review and improvement.

It has been initially submitted as part of the Environmental Protection Statement and provides preliminary information on Iluka's approach to rehabilitation of the proposed disturbance area.

Following the process of EIA, the plan will be updated to the satisfaction of the EPA. The management plan shall then be reviewed on an annual basis, to account for progress or changes that may be required to achieve the designated performance targets.

15. REPORTING

Reporting of activities, rehabilitation planning and monitoring results will be through the existing annual environmental reporting process to the DEC and DoIR.

16. REFERENCES

EPA (2006) Guidance for the Assessment of Environmental Factors no. 6: Rehabilitation of Terrestrial Ecosystems

Mattiske Consulting Pty Ltd. (2006) *Flora and Vegetation Assessment for the Burekup Area.* Report prepared for Iluka Resources Limited.

Parsons Brinckerhoff (2007) *Burekup Deposit: Modelling of Groundwater Level Impacts.* Report to Iluka Resources Ltd.

Soil Water Consultants (2007a) Preliminary Soil Assessment for the Proposed Burekup Mine Site. Report prepared for Iluka Resources Limited.

Soil Water Consultants (2007) Groundwater Dependent Ecosystem Assessment for the Proposed Burekup Minesite. Report prepared for Iluka Resources Limited.

17. DOCUMENT CONTROL

Revision	Reviews/Changes	Create Date
A	First Draft	31 October 2007
B	Internal Review	7 November 2007
C	Comments incorporated	25 November 2007