

REFERRAL OF A PROJECT FOR A DECISION ON THE NEED FOR ASSESSMENT UNDER THE *ENVIRONMENT EFFECTS ACT 1978*

REFERRAL FORM

Preamble

The *Environment Effects Act 1978* provides that where proposed works may have a significant effect on the environment, either a proponent or a decision-maker may refer these works (or project) to the Minister for Planning for advice as to whether an Environment Effects Statement (EES) is required.

This Referral Form is designed to assist the provision of relevant information in accordance with the *Ministerial Guidelines for Assessment of Environmental Effects* (Seventh Edition, 2006), in particular by proponents. Where a decision-maker is referring a project, they should complete a Referral Form to the best of their ability, recognising that further information may need to be obtained from the proponent.

It will generally be useful for a proponent to discuss the preparation of a Referral with the Department of Sustainability and Environment (DSE) before submitting the Referral.

If a proponent believes that effective measures to address environmental risks are available, sufficient information could be provided in the Referral to substantiate this view. In contrast, if a proponent considers that further detailed environmental studies will be needed as part of project investigations, a more general description of potential effects and possible mitigation measures in the Referral may suffice.

In completing a Referral Form, the following should occur:

- Mark relevant boxes by changing a font colour of the 'cross' to black and provide additional information and explanation where requested.
- At least a brief response should be provided for each item in the Referral Form, with a more detailed response provided where the item is of particular relevance. Cross-references to sections or pages in supporting documents should also be provided. Information need only be provided once in the Referral Form, although relevant cross-referencing should be included.
- Responses should and honestly reflect the potential for adverse environmental effects. A Referral will be accepted for processing once DSE is satisfied that it has been completed appropriately.
- Potentially significant effects should be described in sufficient detail for a reasonable conclusion to be drawn whether the project could pose a significant risk to those assets. Responses should document:
 - a brief description of potential changes or risks to environmental assets resulting from the project
 - available information on the likelihood and significance of such changes
 - the sources and accuracy of this information, and associated uncertainties.
- Any attachments, maps, supporting reports, etc. should be provided in a secure folder with the Referral Form.

- A CD or DVD copy of all documents will be needed, especially if the size of electronic documents may cause email difficulties. Individual documents should not exceed 2MB.
- A completed form would normally be between 15 and 30 pages in length.
- The form should be completed in MS Word and not handwritten.

The party referring a project should submit a covering letter to the Minister for Planning together with a completed Referral Form, attaching supporting reports and other information that may be relevant. This should be sent to:

Postal address

**Minister for Planning
PO Box 500
EAST MELBOURNE VIC 3002**

Couriers

**Minister for Planning
Level 17, 8 Nicholson Street
EAST MELBOURNE VIC 3002**

Submission of an electronic copy of the Referral via email to ees.referrals@dse.vic.gov.au is encouraged, at the same time as and in addition to the hardcopy submitted to the Minister. This will assist the timely processing of a referral.

PART 1 PROPONENT DETAILS, PROJECT DESCRIPTION & LOCATION

1. Information on proponent and person making Referral

Name of Proponent:	Barwon Water
Authorised person for proponent:	Paul Northey
Position:	Corporate Manager Strategy & Projects
Postal address:	61-67 Ryrie Street, Geelong 3220
Email address:	Paul.Northey@barwonwater.vic.gov.au
Phone number:	(03) 5226 2355
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Person who prepared Referral:	
Position:	
Organisation:	GHD Pty Ltd
Postal address:	8/180 Lonsdale Street, Melbourne, 3000
Email address:	
Phone number:	(03) 86878000
Facsimile number:	(03) 86878111
Available industry & environmental expertise: (areas of 'in-house' expertise & consultancy firms engaged for project)	<p>Barwon Water has experience in water infrastructure planning, project development, project implementation, environmental management and consultation. Barwon Water engaged suitably qualified consultants to undertake the following investigations.</p> <p>GHD Pty Ltd were responsible for coordinating all assessments and for undertaking the following specialist studies:</p> <ul style="list-style-type: none"> ▶ Planning Assessment ▶ Social and Economic Assessment ▶ Geology and Geotechnical Assessment; ▶ Terrestrial Flora and Fauna Assessment – Infrastructure (fauna component); ▶ Surface Water Assessment – Waterway Crossings; ▶ Greenhouse Gas Assessment; ▶ Traffic Impact Assessment; ▶ Landscape and Visual Impact Assessment; ▶ Noise Assessment; ▶ Dust and Odour Assessment; ▶ Waste Assessment; ▶ Spoil Management; ▶ Reinstatement and Weed Management; ▶ Hydrogeological Assessment; and ▶ Aquatic Assessment – Groundwater Extraction.

	<p>Ecology Australia Pty Ltd undertook flora and fauna assessments, including:</p> <ul style="list-style-type: none"> ▶ Terrestrial Flora and Fauna Assessment – Infrastructure (flora component); and ▶ Terrestrial Flora and Fauna Assessment – Groundwater Extraction. <p>TerraCulture Pty Ltd undertook the cultural heritage assessment and prepared the Cultural Heritage Management Plan.</p>
<p>Relevant Documents</p>	<p>This EES referral comprises the following:</p> <ul style="list-style-type: none"> ▶ This EES referral form, which has been completed in the format provided by the Department of Planning and Community Development for the referral of projects to the Minister for Planning for a decision on whether further assessment is required under the <i>Environment Effects Act 1978</i>; and ▶ Supporting documentation comprising the Project Impact Assessment Report for the Project (hereafter referred to as ‘the supporting documentation’), which is an integrated assessment report, including all assessments undertaken and all specialists reports (as Appendices).

2. Project – brief outline

Project title: Anglesea Borefield Project							
Project location: (<i>describe location with AMG coordinates and attach A4/A3 map(s) showing project site or investigation area, as well as its regional and local context</i>)							
Refer Figure 1: Project Overview							
The project area is located entirely within the Surf Coast Shire to the north and northwest of Anglesea. Anglesea is located 110 kilometres southwest of Melbourne along the Great Ocean Road.							
Project investigations have focused on two areas within the larger project area; that where Project infrastructure is proposed, and that where the Upper and Lower Eastern View Formation aquifers are unconfined at the surface, within which surface water systems have the potential to be impacted by groundwater extraction.							
Project area - infrastructure							
The proposed Bores, Borefield Collection Pipeline, Pre-treatment Plant and Transfer Pump Station are located immediately to the north of the Anglesea Township, in and around the Anglesea Heath and Great Otway National Park. The Southern Borefield is located along Coalmine Road, which runs between the northern most extent of Anglesea and the Alcoa Coalmine. The Northern Borefield is located ~5 km to the north, at Barwon Water's Anglesea Basin site and along the associated decommissioned channel. A Borefield Collection Pipeline connects the bores with the Pre-treatment Plant and Transfer Pump Station, which are also located at the Anglesea Basin site.							
For the most part, the proposed Transfer Pipeline, which connects the Pre-treatment Plant to Wurdee Buloc Reservoir, is aligned in cleared farmland. The Reservoir is located approximately 20 kilometres northwest of Anglesea and 7 kilometres southeast of Winchlesea.							
Project area – groundwater extraction							
The Lower Eastern View Formation (LEVF) outcrops over c. 66 km ² in the Eastern Otways. It is the most western of three outcrops that form the surface geology of the Anglesea Heaths and Heathy Woodlands. Of the remaining two, the Upper Eastern View Formation (UEVF) is associated with the aquifer utilised by Alcoa since the late 1960s and the Middle Eastern View Formation (MEVF) is an aquitard that separates the two - refer Figure 2-2: Eastern View Formation – Cross Section in the supporting documentation. The outcrops are principally drained by three catchments (size km ²):							
<ul style="list-style-type: none"> ▶ Anglesea River / Marshy Creek (66 km²); ▶ Salt Creek (51 km²); and ▶ Distillery Creek (18 km²). 							
These catchments, incorporating the extensive swamplands of the lower reaches of Anglesea River (also known as Marshy Creek) and Salt Creek, and are within the area of predicted drawdown. AMG Coordinates for key project elements are provided below.							
Longitude and Latitude Coordinates for Key Project Elements							
		Latitude			Longitude		
Location Point	degrees	minutes	seconds	degrees	minutes	seconds	
Anglesea Basin site	38	21	08	144	11	20	
Wurdee Buloc Reservoir (approx centre)	38	17	17	144	02	22	

Short project description (few sentences):

Barwon Water is proposing to extract approximately 7,000 ML/year from the Lower Eastern View Formation (LEVF) aquifer via the Anglesea Borefield to supply the Greater Geelong supply system. Production and Observation Bores, a Pre-treatment Plant and Transfer Pump Station, a Borefield Collection Pipeline and Transfer Pipeline are proposed to extract, treat and transfer groundwater from the Anglesea Borefield to Wurdee Boluc Reservoir.

3. Project description**Aim/objectives of the project** (what is its purpose / intended to achieve?):

The objective of the Anglesea Borefield Project is to provide the capacity to meet immediate and future water demand in the Greater Geelong urban water supply system.

Barwon Water's response to future water supply augmentation options for their water supply systems are identified in their *Water Supply Demand Strategy* (WSDS) released in 2007. The Anglesea Borefield Project (targeting the Lower Eastern View Formation aquifer) is one of a number of projects identified in the WSDS to meet the urban water supply needs of the Greater Geelong region both now and into the future. These projects include water conservation and efficiency, alternative supplies, interconnections and augmentations including the Anglesea Borefield Project. In preparation for continued dry conditions, the Anglesea Borefield Project has been identified as the first augmentation option for Barwon Water's Greater Geelong supply system. It is the only augmentation option that can be delivered by 2009.

Based on current estimates of yield, the Project is expected to deliver approximately 7,000 ML/a.

Background/rationale of project (describe the context / basis for the proposal, eg. for siting):**Strategic context**

The Geelong region's water is supplied by three major surface water sources - the Barwon River, East Moorabool River and West Moorabool River. The Barwon River system, from its Otway Ranges catchment, supplies approximately 70% of the water for Geelong, Bellarine Peninsula and the Surf Coast via the Wurdee Boluc Reservoir. The balance is supplied from catchments on the Moorabool River system. The Barwon Downs Borefield also supplements this region during drought periods. Population growth, changing land uses, economic development, drought and climate change are placing increasing demand on the Geelong region's major surface water supplies – principally the Barwon and Moorabool River Systems.

According to the *Central Region Sustainable Water Strategy* (CRSWS) released by the Victorian Government in October 2006, it is possible that the lower average streamflows experienced since 1997 represent a permanent stepped change in inflows linked to climate change, which mean that Barwon Water:

- ▶ Can expect an immediate shortfall of water under a continued low flow scenario; and
- ▶ Will require an extra 8,000 ML/a by 2010 increasing to 10,000 ML/a by 2015.

The CRSWS identifies a broad range of actions to address projected water shortfalls within the central region. As part of the extensive technical investigations undertaken in developing the CRSWS, Victorian groundwater resources were reviewed. This included a re-assessment of the Jan Juc Groundwater Management Area's Eastern View Formation aquifer, located in the vicinity of the Anglesea Township. The CRSWS identified the potential for higher yields from the Lower Eastern View Formation (LEVF) aquifer than initially anticipated in earlier studies, suggesting a potential yield in the order of 7,000ML/a. As a result, this aquifer was identified as a viable water supply option for the Greater Geelong water supply system. The CRSWS states

that the State government will grant Barwon Water an entitlement for the use of the Jan Juc deep aquifer (refer Action 4.15 titled 'Jan Juc Deep Aquifer'), subject to a feasibility study and business case.

Other supply augmentation projects identified in the CRSWS and further detailed in the WSDS are as follows:

- ▶ ***Newlingrook Aquifer*** - This project would involve the construction of production bores, pipelines and pre-treatment facility to transfer bore water from the Newlingrook Aquifer to the West Barwon Reservoir. Initially up to 16,000 ML/year could be provided.
- ▶ ***Interconnection to Melbourne Water System*** - This project would involve the construction of a 50 km long pipeline and pump station to transfer up to an additional 16,000 ML/year.
- ▶ ***Dewing Creek Diversion*** -The project would involve reinstating an existing diversion to enable Barwon Water to harvest 1,000 ML/year.
- ▶ ***Desalination*** - Desalination involves extracting drinking water from seawater. There is no limit to how much water can be extracted, though this process is highly energy intensive.

The Anglesea Borefield Project was selected by Barwon Water for implementation for the following reasons:

- ▶ It is the only augmentation option that has the potential to meet the timeframes for commissioning by 2009, which is critical in preparing for continuing dry conditions;
- ▶ It represents a new source of water to Barwon Water;
- ▶ It can supply a significant proportion of the identified shortfall;
- ▶ It is of a comparative or lesser cost on a Net Present Value (NPV)\$ per ML basis than other augmentation options; and
- ▶ It is not reliant on availability of water from another water supply system, i.e. interconnection with Melbourne Water.

Project infrastructure has been sited to avoid and minimise disturbance to the existing environment. This is described in section 4 of this form.

Main components of the project (nature, siting & approx. dimensions; attach A4/A3 plan(s) of site layout if available):

Bores – Refer to Figure 3-2 in the supporting documentation for a plan showing the proposed location of bore sites

Test Bores

Pump tests are a necessary part of the hydrogeological investigations for the Project. In order to meet project deadlines, pump tests needed to begin prior to the submission of approval documentation for the overall Project. Thus Barwon Water has obtained planning permits through the Surf Coast Shire to construct test bores (two observation bores and one test production bore) in each of the borefields. As the test production bores will become operational production bores (if successful) and observation bores will be maintained for monitoring purposes (if successful), all test bores have been considered in this referral as part of the overall Project.

Observation Bores

The above-ground infrastructure associated with the observation bores consists of a standpipe. The standpipes are approximately one metre tall and will be located in areas that are easily accessible for monitoring.

Production Bores

If successful, the test production bores will become production bores. The number and location of other production bores will be confirmed following the testing phase. It is expected that between 7 and 10 production bores will be required, with the majority (5 - 7) of these located in the Southern Borefield (due to a deeper syncline with a higher yield of groundwater).

The final footprint of each production bore will cover an area of approximately 400 m² and will be fenced off with cyclone fencing, 1.8 m high. Production bores will require bore pumps to transfer water to the Pre-treatment Plant. These pumps will be housed in the bore casing approximately 100-200 m below the surface.

Production and deep observation bores will be drilled 450-500 m deep (Southern Borefield) and 300-350 m deep (Northern Borefield). Shallow observation bores will be drilled 150-180 m deep.

Pre-Treatment Plant and Transfer Pump Station – Refer to Figure 3-9 in the supporting documentation for a plan showing the proposed location and layout.

Historical data indicates the groundwater in the Lower EVF has low pH, high temperature and high levels of iron and manganese. The iron and manganese levels are higher than can be accommodated by the existing Wurdee Buloc Water Treatment Plant and thus pre-treatment will be required locally before the water can be transferred. There are also difficulties in transferring raw water of this quality due to sludge produced through oxidation of the iron/manganese. A Pre-Treatment Plant is thus proposed to treat the bore water, prior to transfer (by a Transfer Pump Station) to Wurdee Boluc.

The proposed pre-treatment process includes pre-chlorination, aeration, chemical dosing, oxidation and flocculation then settling and cooling. There is no discharge to the environment from this Pre-treatment Plant, with the exception of an iron and manganese rich sludge forming on the base of the 80 ML earthen basin as a result of the lime dosing and settling of water, which will collect in the existing earthen basin and require disposal approximately every ten years.

The proposed location for the Pre-Treatment Plant and Transfer Pump Station is the Anglesea

Basin site managed by Barwon Water. These facilities will require will require an area of ~7000 m² within the site boundary.

Pipelines –The proposed pipeline alignments are shown in Figure 1

Borefield Collection Pipeline

A Borefield Collection Pipeline is proposed to collect groundwater from the production bores and transfer it to the Pre-treatment Plant. The pipe used will be between 300-600 mm in diameter. The section connecting the Southern Borefield begins at bore 1 near the intersection of Coalmine Road and Messmate Track. The approximate length of this section is 9 km. The section connecting the Northern Borefield begins at bore 7 near Forest Road and runs along the decommissioned channel to the Pre-treatment Plant site. The approximate length of this section is 1.8 km.

Transfer Pipeline

A Transfer Pipeline is proposed to transfer water, approximately 20 km, from the Pre-treatment Plant to Wurdee Boluc Reservoir. At the Reservoir, the water will be mixed with stored water for further treatment at the existing Wurdee Boluc Water Treatment Plant. The pipe used will be 600 mm in diameter.

Ancillary components of the project (eg. upgraded access roads, new high-pressure gas pipeline; off-site resource processing):

Upgrades and extensions will be required to the local electricity distribution network to provide the required load to the Bores, Pre-treatment Plant and Transfer Pump Station. The construction of all power supply assets to the sites is the responsibility of Powercor. Preliminary discussions have been held with Powercor. Based on these preliminary discussions it appears there will not be any additional disturbance/removal of vegetation required (to that accounted for in the present assessments) to install the upgrades and extensions.

Vehicle access to the pipeline through private property will be required for construction and ongoing maintenance. Whilst preliminary discussions have been held with landowners, access points/ways have not yet been agreed. Existing vehicle access points/ways will be utilised wherever possible. If new access points/ways are required, they will be identified to avoid native vegetation wherever possible and agreed in consultation with landowners.

If some additional disturbance/removal of native vegetation is necessary to accommodate these ancillary components, this is expected to be relatively minor - further assessments will be undertaken and DSE will be consulted.

The hydrogeological assessment has recommended additional monitoring bores be installed. The number and location of these is to be confirmed following determination of the Bulk Entitlement.

Key construction activities:

Construction methods are described in detail in Section 10 of the supporting documentation and summarised below.

Bores

Observation and production bores will require a construction area of approximately 2,500 m².

Specialist drilling contractors with the appropriate drill rigs will construct bores to the required depths and install the casing pipe. At various stages in the drilling program, contractors will be required to operate continually for 24 hours a day. The deepest production bores are anticipated

to take approximately 8 weeks to construct. Other specialist subcontractors will install the bore pumps, electrics and above ground pipework.

During the construction and commissioning of bores there will be wastes that require management and disposal. Construction wastes will be contained within the site boundaries, before disposal off site. The main forms of waste produced during construction of the bores are:

- ▶ Drilling sediments/spoil;
- ▶ Drilling muds
- ▶ Development water; and
- ▶ Test pump water

Proposed management/disposal/reuse methods are described in section 13 and 16 of this form.

Pre-treatment Plant and Transfer Pump Station

The Pre-treatment Plant and Transfer Pump Station are proposed to be located at Barwon Water's Anglesea Basin site. Various buildings, pipework, one production and two observation bores (test bores) are also to be located at this site. Works will be confined within the existing boundaries of the site, construction materials and supply items will be stockpiled within the boundaries of the site, however the existing access from Forest Road will require upgrade and improvement. It may be necessary to modify the existing basin and this could require minor earthworks, lining and installation of baffles.

Construction of the Pre-treatment Plant will require some items of specialist equipment. Construction of the Transfer Pump Station will incorporate mechanical and electrical components. Supply and installation of these facilities is expected to require various specialist subcontractors.

Borefield Collection and Transfer Pipelines

The Borefield Collection and Transfer Pipelines will be installed, for the majority of their length by open cut trenching. In some areas, the construction corridor will be constrained to avoid and minimise impacts to native vegetation. Some waterway crossings (as agreed with the CMA) and road crossings will be constructed using trenchless techniques to avoid and minimise impacts. The general method for pipeline installation is described below.

- ▶ Clearing will include stripping and stockpiling of topsoil for later reinstatement, removal of fences and other minor structures.
- ▶ The pipelines will be installed by open cut trenching. The trenches will be excavated by a track mounted excavator or backhoe.
- ▶ The excavated trenches will be approximately 0.6 - 1 m wide and 1.2 - 1.5 m deep, depending on the diameter of the pipeline.
- ▶ The pipes will be placed in the trenches by an excavator or backhoe, using special slings to carry and lift the pipes into place.
- ▶ A pipe embedment material such as selected sand or crushed rock material will be placed around the pipe for structural support in the trench.
- ▶ The trench will be backfilled with excavated trench material and/or crushed rock.
- ▶ Topsoil will be reinstated.

Key operational activities:***Bores, Pre-treatment Plant and Transfer Pump Station***

Once commissioned, Barwon Water Operations staff will operate the Bores and the Pre-treatment Plant/Transfer Pump Station.

To provide continued satisfactory operation of the system, each Bore and the Pre-treatment Plant/Transfer Pump Station site will be visited and routinely inspected by an operator. This inspection will involve visual checks and inspection of control systems. Regular servicing of the Bore Pumps, and other equipment at the Pre-treatment Plant/Transfer Pump Station site will be required. An Operations and Maintenance Management Plan will be prepared by Barwon Water which will outline the tasks and timing of routine maintenance works.

Pipelines

Once commissioned, the Borefield Collection and Transfer Pipelines will require minimal servicing. Routine maintenance procedures include: checking the operation of air valves; and visual inspection along the pipe alignment.

Key decommissioning activities (if applicable):

In accordance with the Draft Groundwater-Regional Urban Water Authority Licensing Guidelines (Water Act 1989), the groundwater modelling has assessed the Project over a 50 year period (until 2056). The period over which the Bulk Entitlement for groundwater extraction will extend, is yet to be determined. Project infrastructure is expected to have an operational life of up to 100 years depending on demand and the integrity of the construction.

Is the project an element or stage in a larger project?

No Yes If yes, please describe: the overall project strategy for delivery of all stages and components; the concept design for the overall project; and the intended scheduling of the design and development of project stages).

Is the project related to any other past, current or mooted proposals in the region?

No Yes If yes, please identify related proposals.

4. Project alternatives

Brief description of key alternatives considered to date (eg. locational, scale or design alternatives. If relevant, attach A4/A3 plans):

Site and Alignment Selection

Careful siting and design of infrastructure has been essential in avoiding and minimising potential environmental impacts arising from the project, particularly to native flora and fauna, given the significant ecological values of the Anglesea Heath and Great Otway National Park in the southern section of the project area. Wherever possible, sites and alignments have been selected to make use of previously disturbed or modified areas, existing easements and cleared farmland and construction methods have been designed to minimise impacts.

Two tools were used to assess and validate the options considered:

- Project-specific selection guidelines; and
- GHD's Infrastructure Corridor Assessment (INCA) method.

Government agency representatives (via the Agency Reference Group for the Project), landowners and representatives of local environment groups were consulted through this process. The process is documented in detail in the *Site and Alignment Selection Report* (Appendix B of the supporting documentation). The *Flora and Fauna Assessment Report – Infrastructure* (Appendix A of the supporting documentation) provides further information to demonstrate compliance of the Project with the 3-stage process of Net Gain.

Brief description of key alternatives to be further investigated (if known):

N/A

5. Proposed exclusions

Statement of reasons for the proposed exclusion of any ancillary activities or further project stages from the scope of the project for assessment:

Some ancillary components of the Project (power upgrades and access points/ways) have not been assessed in detail, as siting and construction footprints cannot be confirmed at this stage.

The hydrogeological assessment has recommended additional monitoring bores be installed. The number and location of these is to be confirmed following determination of the Bulk Entitlement.

Refer section 3 in this form.

6. Project implementation

Implementing organisation (ultimately responsible for project, ie. not contractor):

Barwon Water.

Implementation timeframe:

Whilst the CRSWS states the Project should be available for Geelong from summer 2010/2011, the Geelong region, like most of Victoria, continues to experience below average rainfall. In preparation for the possibility of continued dry conditions, Barwon Water commenced an implementation program for the Project in December 2006, bringing the Project forward two years. The revised program for the Project is to commence construction in early 2008 with commissioning likely in early 2009.

Proposed staging (if applicable):

N/A

7. Description of proposed site or area of investigation

Has a preferred site for the project been selected?

No Yes If no, please describe area for investigation.

If yes, please describe the preferred site in the next items (if practicable).

General description of preferred site, (including aspects such as topography/landform, soil types/degradation, drainage/ waterways, native/exotic vegetation cover, physical features, built structures, road frontages; attach ground-level photographs of site, as well as A4/A3 aerial/satellite image(s) and/or map(s) of site & surrounds, showing project footprint):

Refer Figure 1 Project Overview.

The Project area is located to the north and northwest of the Anglesea township and extends to the Wurdee Boluc Reservoir. The area impacted by Project infrastructure is located to the east of the outcrops of the Upper and Lower EVF within which surface water systems have the potential to be impacted by groundwater extraction. The Lower Eastern View Formation (LEVF) outcrops over c. 66 km² in the Eastern Otways. It is the most western of three outcrops. Of the remaining two, the Upper Eastern View Formation (UEVF) is associated with the aquifer utilised by Alcoa since the late 1960s and the Middle Eastern View Formation (MEVF) is an aquitard that separates the two. Refer Figure 2-2 and 3-4 in the supporting documentation).

Biogeography

The Project area is predominantly located on the eastern and northern flanks of the Otway Ranges. Topography falls rapidly from 300-400 m Australian Height Datum (mAHD) on the eastern edge of the Otway Ranges, to 0-50 mAHD along the coastal plains to the east. These areas are quite distinct biogeographically. The eastern section is characterised by dissected

terrain of early Tertiary age, the Eastern View Formation, and supports the well-known Anglesea heaths and heathy woodlands. Soils are mostly sandy, derived from marine and non-marine sediments. The major catchments of Salt Creek and Anglesea River (Marshy Creek) drain southwards, to form a large swampland system and the Anglesea River and estuary. It is within this land system that the proposed Borefields and Borefield Collection Pipeline are proposed.

The northern flanks are more gently undulating with broad plateau-like ridgelines. The surface geology is late Tertiary (the Moorabool Viaduct Formation) and the vegetation is dominated by heathy and grassy woodlands. This land system has been extensively cleared, with a notable reduction in the extent of remnant vegetation north of the catchment divide, represented by the ridgeline traversed by Forest and Tanners Road. The main drainage basins are Spring Creek, which discharges at Torquay, and Thompson Creek, which forms a large saltmarsh estuary at Breamlea. It is within this northern land system that the Transfer Pipeline from the Anglesea Basin to Wurdee Boluc Reservoir is proposed.

These two areas contrast in their respective biodiversity values and hence the constraints imposed on the Project.

Built Environment

Anglesea is the largest urban area, with other smaller towns scattered along the coast. There are few major roads crossing the area, the exception being the Great Ocean Road along the coast.

Industry related modifications to the surrounding landscape include the following:

- ▶ The Alcoa open cut brown coal mine and power plant immediately to the north of the Anglesea township and associated transmission powerlines which run in a north-easterly direction to Geelong; and
- ▶ The quarry adjacent to the Gherang Gherang Bushland Reserve (south of the Transfer Pipeline alignment, between Forest and Nobles Roads).

Plans

Plans have been prepared to provide an overview of the following aspects within the Project area:

- ▶ Project Overview (Figure 1)
- ▶ Topography (Figure 2);
- ▶ Regional Geology (Figure 3);
- ▶ Eastern View Formation – Cross Section (Figure 2.2 in the supporting documentation)
- ▶ Eastern View Formation – Outcrops (Figure 3-4 in the supporting documentation)
- ▶ Parks & Reserves including the Great Otway National Park and Anglesea Heath (Figure 3-3 in the supporting documentation);
- ▶ Overview of Ecological Vegetation Classes (EVCs) (Figure 4);
- ▶ EVC's relevant to Project impacts (refer Appendices A & D of the supporting documentation)
- ▶ Biosites (Figure 5);
- ▶ Land Tenure (Figure 6);
- ▶ Great Otway National Park / Anglesea Heath and the Eastern View Formation (Figure 7);
- ▶ Waterways intersected by the pipeline (Figure 7-2 in the supporting documentation); and
- ▶ Waterways impacted by groundwater extraction (refer Appendix N of the supporting documentation).

Site area (if known): Each production bore site will require ~2500m² for construction and ~400m² for operation. The Pre-treatment Plant and Transfer Pump Station will require an area of ~12,000 m² for construction and ~7000 m² for operation within the Anglesea Basin site.

Route length: Total pipeline length is ~30 km

Route width: Pipeline corridor construction width is 6 - 20 m (construction easement) and 10 m (final pipeline easement)

Current land use and development:

The Project area comprises the following land uses:

- Great Otway National Park;
- The Anglesea Heath, comprising 490 hectares of land for mining and power generation, (the Mining Area) and 6,731 hectares of land for conservation (co-managed by Parks Victoria and Alcoa);
- Unreserved crown land, roads/road reserves (managed by the Surf Coast Shire);
- Private farmland, characterised by cropping and grassed paddocks (including two sections of existing Barwon Water easement along Flaxbournes Road and the last 4 km before Wurdee Buloc Reservoir); and
- Crown land managed by Barwon Water for water supply (Anglesea Basin site, see below).

Description of local setting (eg. adjoining land uses, road access, infrastructure, proximity to residences & urban centres):

Bore sites

The southern bore sites are located along Coalmine Road, which runs between the northern most extent of Anglesea and the Alcoa Coalmine. Bore sites have been located where native vegetation has been previously disturbed and/or modified. Four of the bore sites are located in the Anglesea Heath, three are on freehold land and one on unreserved crown land. There are a number of residences located on the northern fringe of Anglesea that are within 1 km of the southern borefield, the closest of which are approximately 200 m away.

The northern bore sites are located ~5 km north of the Southern Borefield. One bore is proposed at the Pre-treatment Plant and Transfer Pump Station site (see below). Two bores are proposed along the decommissioned channel, which runs between the Basin site and Forest Rd. This section of decommissioned channel is within the Great Otway National Park and is the only area of National Park directly impacted by Project infrastructure. The closest residence to the northern borefield (to bore 6 within the Basin site) is approximately 900 m away.

Pre-treatment Plant and Transfer Pump Station site

The Pre-treatment Plant and Transfer Pump Station, one production and two observation bores (test bores) and associated pipeworks are proposed at Barwon Water's Anglesea Basin site. This site is located ~ 5 km north of the Anglesea Township, offset ~100 metres from Forest Road and is immediately adjacent to both the Great Otway National Park and the Anglesea Heath. The site is crown land reserved for Barwon Water. Existing facilities currently operated by Barwon Water at this site include a large water tank and a disinfection booster facility. There are four rural residences located less than 1 km east of these proposed facilities. The closest of these residences is approximately 870 m from the proposed site boundary.

Pipeline alignments

The Borefield Collection Pipeline will pass nearby the northern outskirts of Anglesea and a number of rural residences. The section of Borefield Collection Pipeline connecting the Southern

Borefield begins at bore 1 near the intersection of Coalmine Road and Messmate Track. This section will be installed in roads, existing tracks and cleared private land. The section of Borefield Collection Pipeline connecting the Northern Borefield begins at bore 7 near Forest Road and runs along the decommissioned channel (refer above) to the Pre-treatment Plant site.

The proposed Transfer Pipeline, which connects the Pre-treatment Plant to Wurdee Buloc Reservoir, is aligned in the decommissioned channel (refer above), Flaxbournes Road (part), cleared farmland and an existing Barwon Water easement (the last 4 km before the Reservoir). Sections of the Transfer Pipeline, located to the north of the Pre-treatment Plant, will pass through several kilometres of uninhabited country as well as areas of farmland, nearby a number of rural residences.

Planning context (eg. strategic planning, zoning & overlays, management plans):

The planning approvals process for the Project is subject to the *Planning and Environment Act 1987*. Planning requirements associated with the Project will be subject to the current provisions of the Surf Coast Planning Scheme, under which the proposed uses and works associated with the Project require planning permits. To promote sustainable land use management practices and to make efficient use of the Victorian Planning Provisions, it is considered appropriate to prepare a planning scheme amendment pursuant to Section 20(4) of the *Planning and Environment Act 1987* (the Minister for Planning being the authority), for all further works and activities. This option will:

- Provide State control of a priority project, on the proviso that extensive consultation is undertaken and social, economic and environmental effects are identified and addressed;
- Assist in facilitating the implementation of a State significant project;
- Address project timeframes; and
- Reduce administrative work required by Council by omitting the need to consider further planning permit submissions.

The amendment will exempt the works from the permit requirements by amending the schedule to each relevant zone, overlay or clause; or alternatively, the project could be exempt from permit requirements by amending the schedule to Clause 52.03. Barwon Water await advice from the Department of Planning and Community and Development as to the preferred method, prior to making a request to the Minister.

The proposed localities for the project infrastructure are subject to the Surf Coast Shire planning scheme zones and overlay controls as outlined below:

Proposed Land Use	Applicable Zones and Overlays
Northern Borefield	<ul style="list-style-type: none"> • Public Conservation and Resource Zone (PCRZ)
Southern Borefield	<ul style="list-style-type: none"> • Special Use Zone (SUZ1) • Public Park and Recreation Zone (PPRZ) • Vegetation Protection Overlay (VPO1) • Wildfire Management Overlay (WMO) • Land Subject to Inundation Overlay (LSIO)

Borefield Collection Pipeline and Transfer Pipeline	<ul style="list-style-type: none"> • Special Use Zone (SUZ1) • Road Zone (RDZ1 and RDZ2) • Public Park and Recreation Zone (PPRZ) • Public Conservation and Resource Zone (PCRZ) • Farming Zone (FZ) • Public Use Zone (PUZ1) • Wildfire Management Overlay (WMO) • Land Subject to Inundation Overlay (LSIO) • Floodway Overlay (F0) • Environmental Significance Overlay (ESO1) • Vegetation Protection Overlay (VPO1)
Local government area(s):	
The relevant local government is the Surf Coast Shire.	

8. Existing environment

Overview of key environmental assets/sensitivities in project area and vicinity

(cf. general description of project site/study area under section 7):

The key environmental sensitivities associated with the project area and adjacent areas include:

Surface features currently receiving baseflows from the Lower and the Upper Eastern View Formation aquifer systems which are subject to decreased baseflows through extraction. The key assets/sensitivities comprise the Anglesea and Salt Creek Swamplands and the upper reaches of these catchments, which directly overlie parts of the LEVF and UEVF aquifers. Moisture-dependent communities exist in the drainage lines. Field observations and flow data indicate that surface water flows in most of the catchment are intermittent, and largely flow in response to rainfall and runoff events. Some permanent pools have been identified in the swamplands and along some headwater tributaries, however much of the Salt Creek and Anglesea River catchments are ephemeral. The exception to this is the Breakfast Creek Tributary and a section of the lower reaches of Breakfast Creek (in the Salt Creek Catchment), which appear to have perennial flow and support fish populations. These aspects are discussed further in sections 11 and 13 of this form.

Other key environmental sensitivities include:

- The Great Otway National Park;
- The Anglesea Heath;
- Remnant native vegetation and associated habitat, of high and very high conservation value, within and adjacent to the proposed construction footprints/corridors;
- Local watercourses, intersected by the proposed pipeline, particularly the Anglesea River crossing where acid sulphate soils are known to occur;
- Anglesea River, south of Coalmine Road, which is in close proximity to the construction, development and testing activities associated with the southern borefield sites and into which the test pump water will be discharged (via Alcoa's Ash Pond in accordance with the existing EPA discharge licence);
- Known aboriginal cultural heritage sites adjacent to, and areas of cultural heritage sensitivity within, the proposed construction footprints/corridors;

- ▶ Residential areas of Anglesea, particularly those adjacent to the southern borefield; and
- ▶ Landscape values.

9. Land availability and control

Is the proposal on, or partly on, Crown land?

No Yes If yes, please provide details.

Project infrastructure intersects both reserved and unreserved crown land parcels in the southern section of the Project area. These are shown on Figure 6: Land Tenure. The crown land parcels in question are managed by:

- ▶ Barwon Water (Anglesea Basin site).
- ▶ Parks Victoria and Alcoa Australia (Anglesea Heath).
- ▶ Parks Victoria (Great Otway National Park)
- ▶ Surf Coast Shire (two areas along Coalmine Road and road reserves)
- ▶ VicRoads (a small section of the Great Ocean Road, road reserve)

Current land tenure (provide plan, if practicable):

Land tenure of the southern section of the Project area is shown in Figure 6.

The Bores, Borefield Collection Pipeline, Pre-treatment Plant and Transfer Pump Station site are all located on crown land, with the exception of three production bore sites (owned by the Golf Club and Alcoa) and a section of pipeline alignment (freehold farmland along Forest Road). A small section of the Transfer Pipeline is located in crown land (decommissioned channel, Flaxbournes Road and road crossings) with the remainder, in freehold farmland.

The outcrops of the UEVF and LEVF within which surface water systems have the potential to be impacted by groundwater extraction is mostly crown land. This area is mostly contained within the Anglesea Heath (Alcoa Lease) and the Great Otway National Park. The notable exception is the upper Anglesea River (on the LEVF outcrop) that includes private holdings, particularly the Vehicle Proving Ground, and other public land adjacent to the Anglesea River (understood to be managed by Parks Victoria).

Intended land tenure (tenure over or access to project land):

- ▶ Bores 1 & 2 are located on freehold land, this land will be acquired by Barwon Water
- ▶ Bore 5a is located on Alcoa freehold land. At this stage this bore site is not preferred, however if it is required, Barwon Water intend to acquire this land.
- ▶ Where Project infrastructure is proposed on unreserved crown land, this will be reserved for the purposes of the Project.
- ▶ Where the pipeline is in freehold land, easements for the pipeline will be created.
- ▶ Project infrastructure proposed in the decommissioned channel between the Anglesea Basin site and Forest Rd, which falls within the Great Otway National Park, will be the subject of a Section 27 Agreement (*National Parks Act 1978*) between Barwon Water and Parks Victoria (submitted to Parks Victoria in September 2007).
- ▶ Project infrastructure proposed in the Anglesea Heath, will be the subject of a Section 138 Agreement (*Land Act 1958*) between Barwon Water, Parks Victoria and Alcoa of Australia Ltd. (submitted to Parks Victoria in September 2007).

Other interests in affected land (eg. easements, native title claims):

A search of the National Native Title Tribunals Native Title applications and determination areas for Victoria indicated that there are no native title claims over the study area. All works on Crown Land require a Native Title determination pursuant to the Native Title Act 1993. The Anglesea Borefield Project has been assessed as a valid future act pursuant to section 24HA(2) of this Act. A Future Act Notice was forwarded to Native Title Services Victoria on 26 November 2007.

Barwon Water have been advised by DSE that there are no further Native Title requirements in this matter.

Barwon Water have existing pipeline easements which will be utilised for this Project including:

- ▶ The section between Forest Rd (where the pipeline leaves the decommissioned channel) and the point where the Transfer Pipeline alignment heads west from Flaxbournes Rd; and
- ▶ The last 4 km section of the Transfer Pipeline alignment before Wurdee Buloc Reservoir.
- ▶ Alcoa Australia Ltd. have a lease over the Anglesea Heath. Bore sites and pipelines are proposed within the Anglesea Heath (these will be subject to a Section 138 agreement under the *Land Act* 1958). The Anglesea Heath covers the vast majority of the UEVF outcrop and sections of the LEVF outcrop also.
- ▶ Alcoa Australia Ltd lease a strip of land from the Anglesea Golf Club on the southern side of Coalmine Rd where bores 1 and 2 are proposed.
- ▶ Anglesea and District Horse Riding Club have a licence to use an area of unreserved crown land on Coalmine Rd where a production bore (and potentially observation bores) are proposed.

10. Required approvals

State and Commonwealth approvals required for project components (if known):

Section 4.3 of the supporting documentation provides an overview of the Commonwealth and State policy and regulatory requirements for the Project. Aside from planning approval (refer section 7 of this form) the following key approvals are required for the Project:

- ▶ Approval of a Cultural Heritage Management Plan (CHMP) through Aboriginal Affairs Victoria (AAV). CHMP no. 10043 was approved on the 21st September 2007 (refer Appendix E of the supporting documentation);
- ▶ This Environmental Effects Statement (EES) Referral submitted to the Department of Planning and Community Development (DPDC) pursuant to the *Environmental Effects Act 1978*, to obtain the Minister for Planning's determination on the need for an EES as a result of the potential for regional or State significant environmental effects;
- ▶ An Environment Protection and Biodiversity Conservation (EPBC) Referral submitted to Department of Environment, Water, Heritage and the Arts (DEWHA) pursuant to the *EPBC Act 1999* for matters of national environmental and cultural heritage significance;
- ▶ Construction and operation of project infrastructure proposed in the Great Otway National Park (GONP) will be the subject of a Section 27 Agreement of the *National Parks Act 1975* between Barwon Water and Parks Victoria for the Project. Submission to Parks Victoria was made in September 2007;
- ▶ Construction and operation of project infrastructure proposed in the Anglesea Heath will be the subject of a Section 138 Agreement of the *Land Act, 1958 (Vic)*. Submission to Parks Victoria and Alcoa was made in September 2007;
- ▶ Approval by the Minister for Environment is required to remove native vegetation of a very high conservation significance, pursuant to the Native Vegetation Management Framework;
- ▶ Approval under the *Flora and Fauna Guarantee Act 1988* to remove protected flora;
- ▶ Approval to construct water supply works on designated waterways from the Corangamite Catchment Management Authority (letter of approval received – refer Appendix C of the

supporting documentation);

- ▶ Approval to construct bores from Southern Rural Water;
- ▶ Approval to extract groundwater, via a Bulk Entitlement (refer part 4 of the Water Act 1989), from DSE;
- ▶ Approval of an Environmental Management Plan (EMP) for the Project; and
- ▶ Approval of a Net Gain Offset Strategy.

This list is not intended to be exhaustive, but instead represents the major approvals required as indicated by the relevant statutory authorities.

The EPA have confirmed in writing that a Works Approval will not be required for the Pre-treatment Plant.

Whilst not related to planning or environmental approvals as such, a Business Case for the Project has been submitted to the Victorian Department of Treasury and Finance. This was approved December 2007.

Have any applications for approval been lodged?

No Yes If yes, please provide details.

Construction and operation of project infrastructure proposed in the Great Otway National Park (GONP) will be the subject of a Section 27 Agreement of the *National Parks Act 1975* between Barwon Water and Parks Victoria for the Project. Construction and operation of project infrastructure proposed in the Anglesea Heath will be the subject of a Section 138 Agreement of the *Land Act, 1958 (Vic)*. Submission to Parks Victoria and Alcoa for the purposes of obtaining approval and developing agreements, was made in September 2007.

In order to meet project deadlines, it was necessary to begin drilling of test bores before approvals for the Project were obtained. Barwon Water applied for planning permits through the Surf Coast Shire for test bores in each of the borefields. The northern test bore site is located within the Anglesea Basin site and the southern test bore sites are located in the vicinity of the intersection of Camp and Coalmine Roads. Planning permits to construct these test bores were obtained between May and November 2007 to enable drilling to begin prior to approval of the overall Project. As the test production bores will become operational production bores (if successful) and observation bores will be maintained for monitoring purposes (if successful), all test bores have been considered in this referral as part of the overall Project.

Approval of a Cultural Heritage Management Plan (CHMP) through Aboriginal Affairs Victoria (AAV). CHMP no. 10043 was obtained on the 21st September 2007

The Corangamite Catchment Management Authority have advised that according to By-law No. 1 *Waterways Protection* (the by-law), persons constructing water supply works on a designated waterway are exempt from the requirement to obtain a permit for the works. However, the by-law requires a person who carries out works to which an exemption applies to do so in accordance with any guidelines prepared by the Corangamite CMA for the purposes of the by-law. Five crossings of designated waterways have been identified. Construction methods and management guidelines for each of these crossings have been agreed with the Corangamite CMA and written confirmation has been received.

Approval agency consultation (agencies with whom the proposal has been discussed):

An Agency Reference Group (ARG) was established for the Project in March 2007. The purpose of the ARG is to facilitate a streamlined approach to Project approvals. Members of the ARG represent the various agencies with statutory requirements relevant to the Project. The ARG have and will continue to meet regularly through the planning and construction phases of the Project.

Focused meetings and site visits with certain representatives have also been held as needed.

Agencies represented on the Anglesea Borefield Project ARG include:

- ▶ Surf Coast Shire;
- ▶ Department of Sustainability and Environment;
- ▶ Southern Rural Water;
- ▶ Parks Victoria;
- ▶ Environment Protection Authority;
- ▶ Corangamite Catchment Management Authority; and
- ▶ Alcoa of Australia Limited.

Whilst Alcoa are not an agency as such, they have been included on the ARG given their significant involvement in this Project by way of existing groundwater extractions (Upper EVF), co-management of the Anglesea Heath (with Parks Victoria), proposed bore site on Alcoa freehold land and proposed disposal of/reuse of development and pump test water to Alcoa system, from the southern borefield.

The first ARG meeting was held on 1 March 2007. Since that time, the group has met on six occasions. The minutes of each of these meetings have been distributed to members and are included as Appendix I to the supporting documentation.

Outside of the ARG forum, the following agencies have been consulted:

- ▶ Commonwealth Department of Environment, Water, Heritage and the Arts (formerly the Department of the Environment and Water Resources);
- ▶ Wathaurong Aboriginal Co-operative;
- ▶ Aboriginal Affairs Victoria;
- ▶ Heritage Victoria;
- ▶ VicRoads;
- ▶ Powercor; and
- ▶ Department of Treasury and Finance (DTF).

Other agencies consulted:

None

PART 2 POTENTIAL ENVIRONMENTAL EFFECTS

11. Potentially significant environmental effects

Overview of potentially significant environmental effects (identify key potential effects and comment on their significance and likelihood, as well as key uncertainties):

Key potential effects related to the construction and operation of infrastructure and groundwater extraction from the Lower Eastern View Formation (LEVF) are presented below.

Effects Related to Infrastructure

Significant effects related to the construction and operation of the proposed infrastructure are not expected. With regards to significant flora and fauna, detailed assessments have confirmed the following:

Proposed infrastructure - potential impact to vegetation:

No vegetation communities listed under the EPBC Act 1999 or the FFG Act 1988 were recorded or are likely to occur. Removal of remnant vegetation has been avoided and minimised where possible through siting and design of infrastructure. Wherever possible, areas previously modified or disturbed have been utilised. More detail regarding the site and alignment selection process has been included in Appendix A and B of the supporting documentation. The following Ecological Vegetation Classes (EVCs) would be affected by the proposed infrastructure:

Ecological Vegetation Class	Conservation status	Conservation significance	Area impacted
Clay Heath	Vulnerable	Moderate	0.50 ha
		High	0.75 ha
		Very High	0.25 ha
Heathy Woodland	Least Concern	Low	0.004 ha
		Very High	2.46 ha
Lowland Forest	Depleted	Moderate	0.012 ha
Grassy Woodland	Endangered	High	0.54 ha
Swampy Riparian Woodland	Endangered	High	0.02 ha

Proposed infrastructure - potential impact to threatened flora:

No EPBC- or FFG-listed species were recorded during the initial or subsequent seasonal surveys. The most significant species recorded include the Otway Grey Gum *Eucalyptus litoralis* and Blotched Sun Orchid *Thelymitra benthamiana* (both vulnerable in Victoria). Impacts on the Blotched Sun Orchid can be avoided by constraining the construction corridor. Lopping of branches of some Otway Grey Gum trees would be required (refer section 12 of this form). The likelihood of significant impacts to these species is low.

Proposed infrastructure - potential impact to threatened terrestrial fauna:

The proposed pipeline alignment and bore sites are predominately located in cleared and/or previously disturbed/modified areas. Of the listed or otherwise threatened fauna species previously recorded for the data review area or recorded during recent surveys, the key threatened terrestrial fauna species potentially affected by the infrastructure include: Spot-tailed Quoll, Southern Brown Bandicoot, White-footed Dunnart, New Holland Mouse and the Rufous Bristlebird. A very minor portion of the potential habitat available for these species in the Eastern Otways will be impacted by the construction of the proposed infrastructure. The likelihood of significant impacts to any of these species is low (refer section 12 of this form).

Proposed infrastructure - potential impact to threatened aquatic fauna:

Database searches and habitat assessments have been undertaken for each of the waterway crossings. Anglesea River was the only waterway flowing at the time of assessment.

There is no record of any species listed under the EPBC Act or the FFG Act for the Anglesea River. In order to avoid/minimise disturbance of native vegetation and acid sulphate soils (known to occur in the area), an aerial crossing across the existing culvert has been recommended. Given the construction method, the risk to aquatic fauna in the Anglesea River is considered low.

Seven species from the Victorian AFD have the potential to occur in the 14 other waterways surveyed, if they were wet. Only one of these is a listed species - the Yarra Pygmy Perch (*Nannoperca obscura*), which is listed as Vulnerable under the EPBC Act and considered Near Threatened in Victoria and listed under the FFG Act. Specimens of the Yarra Pygmy Perch recorded in the Thompson Creek database search (last record was in 1999) were observed in the lower regions of the catchment near Breamlea. There are no records of Yarra Pygmy Perch within the area surveyed for the Transfer Pipeline alignment.

It is considered unlikely that the construction of the pipeline will impact on listed aquatic species.

Effects Related to Groundwater Extraction

The potential hydrogeological and associated ecological effects related to groundwater extraction are based on the predictions from the numerical groundwater model developed as part of the Hydrogeological Assessment. While significant impacts are not anticipated from LEVF extraction, the hydrogeological and ecological interactions are complex, and uncertainties and information gaps remain. Because of this, a precautionary approach, particularly to the initial pumping regime, is recommended. This will allow uncertainties to be addressed and avoid the possibility of significant or irreversible biological impacts. A program for monitoring of hydrogeological parameters and ecological attributes, has been recommended and will be essential to confirm the predictions of the current assessments, refine the numerical groundwater model and manage potential groundwater extraction related impacts.

Key findings of the hydrogeological and ecological (terrestrial and aquatic) assessments are presented below. Recommendations for monitoring and management of potential impacts related to groundwater extraction have been outlined in sections 18 and 20 of this form and are intended to inform the development of a Bulk Entitlement (as per part 4, Sections 34 - 48 of the *Water Act 1989*) for the Project. The Bulk Entitlement is the regulatory instrument through which groundwater extraction volumes, pumping regimes and associated impacts will be managed. The Bulk Entitlement will need to be responsive to future monitoring of hydrogeological parameters and ecological attributes.

The Hydrogeological Assessment for the Project involved development of a transient numerical model to predict impacts over a 50-year pumping period. Two extraction scenarios were considered, one where Alcoa continues extracting groundwater from the UEVF (Scenario 1), the other where Alcoa ceases extraction in 2016 (Scenario 2). Two climate change scenarios were also considered. Refer Section 5-7, Appendix G, of the supporting documentation for details on model development and associated limitations.

Reduced baseflows:

Reduced baseflows to surface water features (i.e. streams or swamps), and increased leakage to underlying aquifers has been identified as a potential impact of extraction from the LEVF as part of this Project. Modelling, a review of the available literature, field data and observations indicate that catchment hydrology is dominated by rainfall and runoff processes rather than groundwater baseflow. However, where the LEVF is unconfined (outcropping at surface), a lowered watertable

will potentially reduce baseflow to “gaining” creeks and swamps, or increase leakage to the LEVF from “losing” creeks and swamps. Creek sections previously receiving baseflow may switch condition from “gaining” to “losing”. This may impact the condition of the creek (i.e. perennial/ephemeral) and local ecology. It may also impact surface water flows to downstream swamps.

Where the LEVF is confined (overlain by other geological formations), impacts to surface water bodies will occur if additional drawdown occurs in the watertable nearest ground surface (e.g. the perched swamp watertable). In the UEVF groundwater levels are already highly modified due to Alcoa’s extraction. Numerical modelling has been used to assess the changes in baseflows and creek/swamp leakage as well as other potential impacts.

- Reduced baseflow to creeks/rivers:** The numerical groundwater model was used to predict impacts to the baseflows of the rivers/creeks in the region. The water balance suggests that baseflow to creeks on LEVF outcrop areas may be reduced by around 1.2 ML/day, 0.7 ML/day of which is related to the proposed Borefield operation and the remainder due to future plans to deepen the Alcoa coalmine and continue extraction from the UEVF. There is however field evidence that the modelled impacts are conservative (refer Section 6.2.2, Appendix G of the supporting documentation).

Many creeks in the area (e.g. Salt Creek) are ephemeral, and the reduction in baseflow to these ephemeral stretches may result in creeks drying out more rapidly in the summer months and being drier for longer periods before surface flows occur in wetter seasons.

Breakfast Creek Tributary and a section of Breakfast Creek may be perennial, although impact to baseflow is expected to be minimal as the predicted drawdown cone in these areas is less than 0.1 m. In addition, along these creek stretches, an unknown but probably significant proportion of the baseflow is from the Otway Group bedrock, which will not be impacted or reduced by drawdown in the LEVF aquifer.

In the upper reaches of the Anglesea River, drawdown of less than 0.1 m is predicted over the majority of the LEVF outcrop area, however there is a stretch near the MEVF/LEVF boundary where drawdown of between 0.1 to 1 m is predicted. This drawdown may impact on the level, frequency and permanency of the pools observed in this area.

- Reduced baseflow to swamplands:** Swamp areas are typically indicative of high groundwater level conditions and hence groundwater discharge can sometimes provide a major inflow component in these areas. However, in the case of the Salt Creek and Anglesea River swamplands, the hydrogeological conceptualisation is that a perched swamp watertable has formed in the alluvial and swamp sediments underlying the swamplands. The perched swamp watertable is largely isolated from the UEVF aquifer by clay and coal layers, which underlie the swamp and alluvial sediments. The perched swamp watertable acts as a “sponge” of finite volume, which is refilled predominantly by rainfall, runoff and interflow in wet periods, and to a lesser extent by direct and indirect baseflow from the UEVF and LEVF aquifers. When inflows to the swamplands exceed the storage volume of the “sponge”, surface water flow is observed at the Salt Creek swampland outlet. The Salt Creek and Anglesea swamplands were once contiguous. However this was modified by the coalmine development and now flows from Salt Creek are diverted around the northern boundary of the coalmine via a channel. Historical data from the Salt Creek swampland outlet (via the channel) suggests that outflows as a result of swamp saturation are common. Therefore a shallow groundwater depth and wet conditions persist throughout the swamplands, maintaining swamp vegetation and fauna throughout the year.

Using historical data from the Salt Creek swampland outlet, a swamplands water balance model was developed for Salt Creek swamp system. This model suggested that baseflow currently contribute around 11% of total inflows to the swamp. The model predictions for 2056, under Scenario 1 and 2, suggest that inflows to the Salt Creek swamp system may be

reduced by around 5-6%. Under Scenario 1 (Aloca extraction continues), a 3% reduction in swamp inflows is predicted as a consequence of the proposed borefield alone, as opposed to a reduction of 5% under Scenario 2 (Aloca extraction ceases). To place this in context, model predictions suggest that total inflow to the swamp may be reduced by 30% under the average climate change scenario, and by 66% under the dry climate scenario. Outside of the LEVF outcrop, the predictive model water balances show that the majority of remaining impact (>95%) to baseflows of surface water features, is across the UEVF outcrop area in the Anglesea Swamplands. The impacts predicted for the upper reaches of the Anglesea Swamp are larger than those predicted for Salt Creek Swamp, as the low permeability coal layer is not interpreted to be present in the upper reaches of the Anglesea Swamp and the majority of baseflow to the Salt Creek Swamp has already been historically reduced by coalmine dewatering and the drying climate.

Insufficient calibration data is available to develop a similar water balance model and confirm the proportion of inflow components or percentage impact to inflows to the Anglesea River swamp system. However, despite the lack of gauged data and water balance model for the Anglesea Swamp, it can be tentatively concluded that predicted impacts to inflows to the Anglesea Swamp are likely to be similar to Salt Creek Swamp. Furthermore, despite the predicted reduction in baseflows to the swamplands, the predicted impact is expected to be insignificant to swamp hydrology, due to the far greater reliance of the system on rainfall and runoff compared to groundwater baseflow. Evidence that Salt Creek Swamp is, and has been, in reasonable hydrological and ecological health throughout the duration of coalmine dewatering also supports this conclusion.

Reduced baseflow - potential impact to vegetation:

The changes in the EVCs induced by the LEVF extraction are likely to be relatively minor rather than severe, but the precise extent and nature of the change cannot be accurately determined at this stage. The hydrogeological finding central to this is, that the catchments are run-off rather than groundwater driven. A substantial change in the swamplands is not expected.

A reduction in the frequency and permanency of the pools (Aquatic Herbland) of the upper Anglesea River could occur with groundwater extraction of the LEVF. Minor changes in the floristics of the Sedgy Riparian Woodland may also occur in the same section of Anglesea River. Comparative analysis of this EVC for the LEVF and the (already drawn down) Upper Eastern View Formation (UEVF) did not reveal any clear trends and the likelihood of major change appears low.

A gradual retraction of Riparian Scrub from the soak-fed slopes in the upper reaches of the Salt Creek (LEVF) could potentially occur. This may take the form of loss and/or reduction of wetter floristic elements and ingress of adjoining drier-site species, with the vegetation gradually becoming ecotonal or transitional.

Reduced baseflow - potential impact to threatened flora:

No flora species listed under the EPBC or FFG Act were recorded during the assessment of the swamplands, streams or drainage lines. None of the listed or threatened species previously recorded within the data review area are dependent on groundwater fed systems and are unlikely to be impacted by the drawdown associated with the LEVF extraction.

Reduced baseflow - potential impact to threatened terrestrial fauna:

Of the listed or otherwise threatened fauna species previously recorded for the data review area or recorded during recent surveys, the threatened species identified as potentially being affected by groundwater drawdown of the LEVF include the Long-nosed Potoroo, Swamp Skink and

Southern Toadlet. The likelihood of significant impacts to these species as a result of groundwater extraction is low (refer section 12 of this form).

Reduced baseflow - potential impact to aquatic fauna:

The Protected Matters Search Tool (*EPBC Act 1999*) revealed that Dwarf Galaxias and Australian Grayling could potentially inhabit the area. This search tool is based upon the predicted distribution of flora and fauna species and/or their habitat; not on known records. Neither of these species were sampled during the fish surveys.

A search of species listed under the *FFG Act 1988* revealed that the Otway Stonefly (*Eusthenia nothofagi*), the Otway Caddisfly (*Taskiria otwayensis*) and the Caddisfly known as *Archaeophylax canarus* could potentially occur in the area. However none of these species have been historically caught and the macroinvertebrate surveys undertaken failed to return any of these species.

The Victorian Aquatic Fauna Database (AFD) search revealed 16 fish species (all native) known from the Anglesea River, 4 species from Breakfast Creek and 2 species from Salt Creek – none of which are listed species.

Of the waterways sampled within the area subject to drawdown, the only fish species sampled were the Southern Pygmy Perch (*Nannoperca australis*) and Shortfin Eel (*Anguilla australis*) in the Breakfast Creek Tributary, neither of which is listed under the *FFG Act* or *EPBC Act*.

Considering the absence of fish within the overall study area, the presence of Southern Pygmy Perch and Shortfin Eel within Breakfast Creek Tributary is highly significant. The presence of these two species, high up in a catchment that has relatively no connectivity, indicates that this is a remnant population.

All analyses tend to indicate that Breakfast Creek Tributary and the adjoining lower Breakfast Creek are unique in relation to other water bodies within the study area. The macroinvertebrate fauna, habitat characteristics, water quality and the presence of fish indicate this waterway has a relatively permanently flowing water source. As such this is the only feature of fresh flowing water known to occur within the area. All other water bodies sampled as part of this study contained short-lived macroinvertebrate communities and contained less than adequate water quality features, indicative of ephemeral systems. Reducing the amount of water available within the Breakfast Creek Tributary catchment could significantly affect the fish populations and the overall ecology of this waterway.

Significant impacts on baseflows to the Breakfast Creek Tributary are not expected (refer *Reduced baseflow to creeks/rivers* above). However the ecology of Breakfast Creek Tributary system will be sensitive to any reduction in flow and so it is recommended that this area be a focus for ongoing monitoring. If monitoring indicates reduction in flows to this tributary due to extraction from the LEVF, pumping rates will need to be reduced or possibly cease all together until water levels recharge.

With the information available, it is possible to make a broad scale assessment of potential impacts to the swamplands, but there is less certainty in the details. The predicted ~5% reduction in inflows to the swamplands, as a result of this Project, are considered incremental in the context of the predicted impacts of climate change (30% and 66% reductions). The relatively small reduction in baseflow is considered unlikely to have a significant impact on the aquatic fauna that inhabit these water bodies. However, generally speaking, the gradual drying through both groundwater extraction and climate change is expected to cause the swamplands to become increasingly acidic, the wetlands to become harsher to colonise when wetted and pH slugs to the Anglesea estuary to become more severe.

Potential for - impact on existing groundwater users, saline intrusion, inter-aquifer flow and subsidence:

- **Impact on existing groundwater users:** Drawdown in the LEVF aquifer or UEVF aquifer as a result of pumping can impact on the operation of existing groundwater bores. Alcoa currently extract 4,000 ML/year from the UEVF aquifer system. In the LEVF there is only one licensed extractor of 250 ML/year. There are 17 extraction bores in total which may potentially be impacted by the proposed extraction, this includes the Alcoa extraction bores as well as stock and domestic bores. The model was used to predict additional drawdown in the existing bores due to proposed Barwon Water pumping. Under both scenarios, model predictions indicate drawdowns exceed 10% of the available drawdown at industrial use bore 46095 (10% maximum impact) and domestic bore 46088 (64% maximum impact). No information is available on the status of these bores, although the industrial bore is most likely an old (unused) Alcoa borehole, given its designated use, and location. The current status of these potentially impacted bores will need to be confirmed and current (baseline) bore performance assessed.
- **Inter-aquifer Flow:** Results from both mine development scenarios suggest that groundwater extraction from the LEVF aquifer is likely to result in increased downward vertical leakage of groundwater from the UEVF aquifer to the LEVF aquifer through the intervening MEVF aquitard. The induced leakage has the potential to affect groundwater quality in the LEVF aquifer since groundwater salinity in the UEVF aquifer is typically higher, around 800-1200 mg/L TDS compared to generally less than 500 mg/L TDS in the LEVF. Assuming that the salinity of the groundwater does not change as it passes through the MEVF, the water drawn from the LEVF boreholes may have a salinity rising to around 722 mg/L in the long-term. This is still below the 1,000 mg/L TDS concentration that is considered acceptable for drinking water purposes under the SEPP (Groundwaters of Victoria, 1997).
- **Saline Intrusion:** Based on current conservative assumptions, in regards to the location of saline groundwater wedge in the aquifer, the model suggests that there is some potential for saline intrusion over time. Despite this result, it is still considered unlikely as there has been no evidence of saline intrusion into the UEVF aquifer during long term pumping by Alcoa. Monitoring of groundwater quality, in the LEVF aquifer, on the coast during pumping will be required to further address this potential impact.
- **Land subsidence.** Subsidence may occur in response to water extraction from the aquifer. No significant subsidence has been observed under 40 years of UEVF dewatering at Alcoa coalmine, and therefore extraction from the underlying LEVF is unlikely to alter this situation. Although subsidence is considered unlikely, this will be further assessed with the numerical model, following testing of soil samples recovered from the investigation boreholes.

12. Native vegetation, flora and fauna

Native vegetation

Is any native vegetation likely to be cleared or otherwise affected by the project?

NYD No Yes If yes, answer the following questions and attach details.

What investigation of native vegetation in the project area has been done? (briefly describe)

A comprehensive terrestrial flora assessment has been undertaken for impacts related to proposed infrastructure. This included a high level assessment of conservation values to guide site and alignment selection followed by a detailed field assessment, incorporating a Stage 1 Net Gain Assessment and seasonal surveys, of the preferred construction footprints/corridor. The methodology is detailed in section 4, Appendix A of the supporting documentation.

An assessment of the terrestrial flora for impacts related to groundwater extraction was undertaken (refer Appendix D of the supporting documentation). The methodology of this assessment was designed to identify groundwater dependant systems, predict impacts of reduced baseflows to these systems, compare the UEVF and LEVF outcrops and establish data for ongoing monitoring.

What is the maximum area of native vegetation that may need to be cleared?

NYD Estimated area:

Clearance associated with construction of infrastructure results in a loss of approximately 2.3 Habitat Hectares (hha), corresponding to a Net Gain target of 4.3 hha.

Drawdown through groundwater extraction is expected to result in vegetation modification rather than outright loss. The Net Gain assessment for this component can only be predictive, as key elements remain speculative. At this stage a very preliminary estimate of Net Gain loss of around 5 hha has been made, which could foreseeably take one or two decades to accrue. Monitoring would ultimately determine the losses and resultant target.

How much of this clearing would be authorised under a Forest Management Plan or Fire Protection Plan?

N/A approx. percent (if applicable)

Which Ecological Vegetation Classes may be affected? (if not authorised as above)

NYD Detailed assessment completed. If assessed, please list.

Ecological Vegetation Class	Conservation status	Conservation significance
<i>Infrastructure</i>		
Clay Heath	Vulnerable	Moderate High Very High
Heathy Woodland	Least Concern	Low Very High
Lowland Forest	Depleted	Moderate
Grassy Woodland	Endangered	High
Swampy Riparian Woodland	Endangered	High
<i>Groundwater extraction</i>		
Aquatic Herbfield	Endangered	Very High
Aquatic Sedgeland	Vulnerable	Very High
Riparian Scrub	Endangered	Very High
Swampy Riparian Woodland	Endangered	Very High
Sedgy Riparian Woodland	Depleted	High

Have potential vegetation offsets been identified as yet?

NYD Yes If yes, please briefly describe.

Other information/comments? (eg. accuracy of information)

The information presented in this section has been prepared by suitably qualified specialists.

There is a high level of confidence in the predictions of impacts related to proposed infrastructure.

The scope of assessment and predictions of impacts to native vegetation related groundwater extraction, are dependent on the predictions of the groundwater numerical model and associated uncertainties. Therefore, there is a moderate level of confidence in the predictions of impacts to native vegetation related groundwater extraction. Drawdown will result in vegetation modification rather than outright loss. The changes in the EVCs induced by the LEVF extraction are likely to be relatively minor rather than severe, but the precise extent and nature of the change cannot be accurately determined at this stage.

Flora and fauna**What investigations of flora and fauna in the project area have been done?**

(provide overview here and attach details of method and results of any surveys for the project & describe their accuracy)

The methodology and results for terrestrial flora and fauna assessments are provided in Appendix A (infrastructure) and Appendix D (groundwater extraction) of the supporting documentation).

The methodology and results for aquatic assessments are provided in Appendix J (infrastructure) and Appendix N (groundwater extraction) of the supporting documentation).

Investigation of effects related to infrastructure

A comprehensive terrestrial flora and fauna assessment has been undertaken for impacts related to proposed infrastructure. This included a high level assessment of conservation values to guide site and alignment selection followed by a detailed field assessment of the preferred construction footprints/corridor. Detailed flora and fauna assessments of the preferred construction footprints/corridor were then undertaken, including field surveys (including Net Gain habitat hectare assessments) and a follow-up seasonal flora survey for key sites identified as having the potential to support rare or threatened species.

An aquatic assessment of waterways intersected by the proposed pipeline alignment was undertaken including a desktop search for listed species and habitat assessments.

Investigation of effects related to groundwater extraction

Studies addressing the hydrogeology and ecology of surface systems were undertaken to examine the implications of groundwater extraction from the LEVF aquifer.

The ecological studies involved desktop reviews and field surveys focusing on potential groundwater discharge areas. The desktop reviews included the use of databases, aerial photography (1947, 1964, 1965 and recent), landsat imagery (2001) and literature. Two levels of field assessments were completed – an assessment of the current values and condition of the major swamp systems in Anglesea River and Salt Creek; and a broad scale comparison of the current values and condition of the LEVF and UEVF outcrop areas.

An aquatic assessment was undertaken of the surface water systems subject to groundwater drawdown. This included field surveys of aquatic fauna (fish and macroinvertebrates), water quality and habitat.

Have any threatened or migratory species or listed communities been recorded from the local area?

NYD No Yes If yes, please:

- List species/communities recorded in recent surveys and/or past observations.
- Indicate which of these have been recorded from the project site or nearby.

Threatened or migratory species and listed communities are dealt with in some details in the terrestrial flora and fauna assessments - Appendix A (infrastructure) and Appendix D (groundwater extraction) and aquatic assessments - Appendix J (infrastructure) and Appendix N (groundwater extraction) of the supporting documentation).

Listed communities

No EPBC- or FFG- listed vegetation or fauna communities have been recorded for the project area.

Threatened flora

A total of 43 rare or threatened flora species have been previously recorded in the data review areas (refer Appendices A and D of the supporting documentation). No species listed under the EPBC- or FFG- Acts were recorded during field surveys of the surface infrastructure and two species listed under the EPBC Act (Spiral Sun-orchid *Thelymitra matthewsii* and Anglesea Grevillea *Grevillea infecunda*) were recorded opportunistically (i.e. outside the swamplands and drainage lines) during the groundwater drawdown field surveys. An additional two threatened flora species (Blotched Sun-orchid – vulnerable, Otway Grey-gum - vulnerable) were recorded during field surveys and six species are classified as rare or poorly known in Victoria: Fringed Midge-orchid *Corunstylis ciliata* (rare), West Coast Peppermint *Eucalyptus* aff. *willisii* (South-western Victoria) (rare), Rosy Baeckea *Euryomyrtus ramosissima* ssp. *prostrata* (rare), *Pterostylis tasmanica* Southern Plume-orchid (poorly known), Southern Blue-gum *Eucalyptus globulus* ssp. *globulus* (rare), and Stalked Brooklime *Gratiola pedunculata* (poorly known).

Threatened terrestrial fauna

A total of 55 rare or threatened terrestrial fauna taxa have been previously recorded in the data review areas (refer supporting documentation). Ten threatened fauna species were recorded within or surrounding the project areas: Rufous Bristlebird (FFG, near threatened), Powerful Owl (FFG, vulnerable), Great Egret (FFG, vulnerable), Chestnut-rumped Heathwren (FFG, vulnerable), Musk Duck (vulnerable), Royal Spoonbill (vulnerable), Grey Goshawk (vulnerable), Swamp Antechinus (FFG, near threatened), White-footed Dunnart (vulnerable) and Southern Toadlet (vulnerable). These species are discussed in detail in the surface infrastructure report (Appendix A of the supporting documentation) and groundwater extraction report (Appendix D of the supporting documentation). Ground-dwelling threatened fauna species potentially affected by the surface infrastructure include: Spot-tailed Quoll, Southern Brown Bandicoot, White-footed Dunnart, New Holland Mouse and the Rufous Bristlebird (addressed below).

As the fauna database search was a 15 km radius around the project areas, the list of fauna species includes several threatened pelagic birds and marine mammals for which there is no suitable habitat within the project areas. These species would not be impacted by the surface infrastructure works or proposed drawdown.

One hundred and twenty-seven bird species occurring in the Atlas of Victorian Wildlife or listed as potentially occurring (or suitable habitat potentially occurring) from the EPBC Protected Matters Search database are listed under the EPBC Act as Migratory and/or Marine-overfly species.

Threatened aquatic fauna – waterway crossings

Database searches and habitat assessments have been undertaken for each of the waterways intersected by the pipeline. The Anglesea River was the only waterway that was wet at the time of assessment. There is no record of any species listed under the EPBC Act or the FFG Act for the Anglesea River. Seven species from the Victorian Aquatic Fauna Database (AFD) have the potential to occur in the 14 other waterways surveyed, if they were wet. Only one of these is a listed species - the Yarra Pygmy Perch (*Nannoperca obscura*). Yarra Pygmy Perch are listed as

Vulnerable under the EPBC Act, are considered Near Threatened in Victoria and listed under the FFG Act. Whilst Yarra Pygmy Perch (EPBC and FFG) has been recorded in Thompson's Creek in the lower regions of the catchment near Breamlea (last record was in 1999), there are no records of Yarra Pygmy Perch within the area surveyed for the Transfer Pipeline alignment.

Threatened aquatic fauna – groundwater extraction

The Protected Matters Search Tool (*EPBC Act 1999*) revealed that Dwarf Galaxias and Australian Grayling could potentially inhabit the area. This search tool is based upon the predicted distribution of flora and fauna species and/or their habitat; not on known records. Neither of these species were sampled during the fish surveys.

A search of species listed under the *FFG Act 1988* revealed that the Otway Stonefly (*Eusthenia nothofagi*), the Otway Caddisfly (*Taskiria otwayensis*) and the Caddisfly known as *Archaeophylax canarus* could potentially occur in the area. However none of these species have been historically caught and the macroinvertebrate surveys undertaken failed to return any of these species.

The Victorian AFD search revealed 16 fish species (all native) known from the Anglesea River, 4 species from Breakfast Creek and 2 species from Salt Creek. None of these species were listed.

Migratory species

Nineteen listed Migratory and/or Marine-overfly bird species were recorded within the surface infrastructure project area and the groundwater extraction project area and a further forty-six species have a moderate or higher likelihood of occurrence in both project areas due to the presence of suitable habitat. Wurdee Boluc Reservoir may be used by large numbers of listed migratory species on occasions. It is unlikely that this would exceed the number of individuals required to be considered an ecologically significant proportion of the population.

For threatened and non-threatened Migratory and/or Marine Over-fly species with a moderate or higher likelihood of occurring, the project areas would not:

- ▶ Support an ecologically-significant proportion of the National population of any species (e.g. >1%); nor
- ▶ Constitute an area of 'important habitat' as defined in the EPBC Act Policy Statement 1.1.

Significant impacts are therefore unlikely on threatened and non-threatened Migratory and/or Marine-overfly species.

If known, what threatening processes affecting these species or communities may be exacerbated by the project? (eg. loss or fragmentation of habitats) Please describe briefly.

Threatening processes relating to infrastructure

The following listed Potentially Threatening Processes listed under the FFG Act may result from the construction of the proposed infrastructure:

- ▶ Degradation of native riparian vegetation along Victorian rivers and streams.
- ▶ Habitat fragmentation as a threatening process for fauna in Victoria.
- ▶ Increase in sediment input into Victorian rivers and streams due to human activities.
- ▶ Input of toxic substances into Victorian rivers and streams.
- ▶ Invasion of native vegetation by "environmental weeds".
- ▶ The spread of *Phytophthora cinnamomi* from infected sites into parks and reserves, including roadsides, under the control of a state or local government authority.
- ▶ Use of Phytophthora-infected gravel in construction of roads, bridges and reservoirs.

Some of these may already be occurring within the project area, and the construction and operation of the Anglesea Borefield Project could exacerbate the impact of these processes. If mitigation measures are fully and successfully implemented, the overall contribution of the project to these processes occurring in the local area is expected to be relatively low.

Threatening processes relating to groundwater extraction

The following listed Potentially Threatening Processes listed under the FFG Act may result from the extraction of groundwater:

- ▶ Alteration of the natural flow of rivers and streams;
- ▶ Degradation of native riparian vegetation along Victorian rivers and streams; and
- ▶ Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.

Both hydrological and ecological assessments have provided recommendations to monitor and manage groundwater extraction related impacts. These are intended to inform the development of a Bulk Entitlement (as per part 4, Sections 34 - 48 of the *Water Act 1989*) for the Project. The Bulk Entitlement is the regulatory instrument through which groundwater extraction volumes, pumping regimes and associated impacts will be managed. The Bulk Entitlement will need to be responsive to future monitoring of hydrogeological parameters and ecological attributes.

Are any threatened or migratory species, other species of conservation significance or listed communities potentially affected by the project?

NYD No Yes If yes, please:

- List these species/communities:
- Indicate which species or communities could be subject to a major or extensive impact (including the loss of a genetically important population of a species listed or nominated for listing) Comment on likelihood of effects and associated uncertainties, if practicable.

Effects relating to infrastructure

Terrestrial Flora

Two threatened species recorded (Otway Grey-gum and Blotched Sun-orchid) are located within or immediately adjoining the pipe alignment. Some pruning of Otway Grey-gum branches would be required, but no trees should require removal. The Blotched Sun-orchid populations will be fenced off and can be avoided. Four species classified as rare or unknown in Victoria were also recorded within the project area: Fringed Midge-orchid, West Coast Peppermint, Rosy Baeckea, and Southern Plume-orchid. These are present as scattered individuals and significant impacts on these species populations are not anticipated.

Threatened terrestrial fauna

Threatened ground-dwelling terrestrial fauna species potentially affected by the construction of the surface infrastructure include: Spot-tailed Quoll, Southern Brown Bandicoot, White-footed Dunnart, New Holland Mouse and the Rufous Bristlebird. The removal of native vegetation has been avoided and minimised to the extent that habitat loss during the construction phase would be expected to represent a minor portion (c. 0.05 ha for New Holland Mouse and c. 4 ha for the remaining species) of the potential habitat available for these species in the Eastern Otways and the Project Area in general. The affected habitat has the potential to recover in part after construction. The likelihood of significant impacts to any of these species is low.

Threatened aquatic fauna

Anglesea River was the only waterway flowing at the time of assessment. There is no record of any species listed under the EPBC Act or the FFG Act for the Anglesea River.

Whilst Yarra Pygmy Perch (EPBC and FFG) has been recorded in Thompson's Creek in the lower regions of the catchment near Breamlea (last record was in 1999), there are no records of Yarra Pygmy Perch within the area surveyed for the Transfer Pipeline alignment.

Therefore it is considered unlikely that threatened aquatic fauna species will be affected by the proposed infrastructure.

Effects relating to groundwater extraction

Threatened terrestrial flora

Three species classified as rare in Victoria may experience a reduction in potential habitat (Riparian Scrub) in the upper reaches of Salt Creek as a result of groundwater drawdown in the LEVF: Swamp Pelican Orchid (rare), Southern Bristle-sedge (poorly known) and Lizard Orchid (rare). Some impact on these species may occur if Riparian Scrub is reduced in extent as predicted.

Threatened terrestrial fauna

Habitat for three threatened fauna species may potentially be affected by groundwater drawdown:

- The stream and drainage-line habitat within the LEVF is considered suitable for the Long-nosed Potoroo. These habitats are likely to undergo only minor change however the structural attributes and/or food supplies are not expected to change, thus significant impacts are considered unlikely.
- The Swamp Skink was recorded in both the Anglesea River and Salt Creek swamplands and is likely to occur in the UEVF and LEVF outcrops. Potential habitat for the Swamp Skink in the LEVF could be reduced under drawdown if the Riparian Scrub in the upper reaches of Salt Creek retracts. However, as a substantial change in swamplands is not expected and these provide large areas of potential habitat, there is a low likelihood of significant impacts on the Swamp Skink.
- The Southern Toadlet breeds in pools following heavy rains, in forested or heath vegetation along creeks and in drainage-lines and is predicted to occur within the LEVF. Drawdown could affect the frequency and duration of pools in habitats in the Anglesea River and Salt Creek LEVF. Because this species has been confirmed to occur within current drawdown areas in the UEVF and given the abundance of potentially suitable habitat in the region, the likelihood of significant impacts on this species is low.

Threatened aquatic fauna

The EPBC Act Protected Matters Search Tool revealed that Dwarf Galaxias and Australian Grayling could 'potentially' inhabit the area. A search of species listed under the *FFG Act 1988* revealed that the Otway Stonefly, the Otway Caddisfly and *Archaeophylax canarus* could potentially occur in the area, however none of these species have been historically caught.

The Victorian AFD search revealed 16 fish species (all native) known from the Anglesea River, 4 species from Breakfast Creek and 2 species from Salt Creek – none of which are listed.

Though extensive survey was undertaken as part of these investigations, no threatened species were sampled. The only fish species sampled in the area were the Southern Pygmy Perch (*Nannoperca australis*) and Shortfin Eel (*Anguilla australis*) in the Breakfast Creek Tributary, neither of which is listed under FFG Act or EPBC Act. Therefore it is considered unlikely that threatened aquatic fauna species will be affected by the proposed groundwater extraction.

Is mitigation of potential effects on indigenous flora and fauna proposed?

NYD No Yes If yes, please briefly describe.

Mitigation of effects related to infrastructure:

Recommendations to manage infrastructure related impacts on indigenous flora and fauna have been made. These recommendations have been incorporated into an Environmental Management Plan Framework for both construction and operation phases. This Framework will inform the development of the Environmental Management Plan (EMP) for the Project. Primary measures to avoid and reduce impacts are outlined below. Further detail is also provided in Appendices A and D of the supporting documentation.

Planning/design phase:

The key strategy to avoid impacts has been to locate the bore sites/ pipe alignments in areas that have been previously disturbed or are of lesser conservation value. Through this process, the removal of remnant patches of vegetation has been avoided for the following components:

- ▶ Southern Borefield: four of the eight sites;
- ▶ Borefield Collection Pipeline: 85% of the alignment;
- ▶ Northern Borefield: one of two/three bore sites and pre-treatment plant / transfer pump station; and
- ▶ Transfer Pipeline: 88% of the alignment.

Where removing remnant vegetation cannot be avoided entirely, the construction corridor width has been minimised, and where possible, located in previously disturbed areas (e.g. tracks) and/or located on the margins of habitat.

Construction phase

Mitigation measures to reduce impacts on vegetation and fauna habitat during the construction phase would include:

- ▶ Under the direction of a botanist/zoologist, construction footprint zones will be marked with high visibility fences in areas supporting native vegetation.
- ▶ Ensuring all associated construction activities (e.g. pipe storage, vehicle parking) are restricted to cleared areas.
- ▶ Where possible, lopping branches instead of removing trees.
- ▶ Where possible, construct outside the 'drip zones' of indigenous trees.
- ▶ Harvesting and stockpiling topsoil for use in reinstatement.
- ▶ Construction noise and other human activity to be minimised during the construction phase, particularly in or near habitat.
- ▶ Where possible, construction in areas supporting native vegetation to be avoided from spring to mid-summer to reduce impacts on fauna breeding activity.
- ▶ Regular checking (minimum each morning and evening) by experienced personnel to release any trapped fauna in sensitive areas.
- ▶ Waters extracted from the bores will be managed according to EPA guidelines.
- ▶ Retaining riparian vegetation as long as possible, i.e. clear immediately prior to construction of the pipeline crossing.

Post-construction phase

Mitigation measures to reduce impacts on vegetation and fauna habitat post-construction would include:

- ▶ Respreading topsoil across the construction zone
- ▶ Monitoring natural regeneration and controlling any emerging weed species. A weed management plan is to be developed
- ▶ Allowing two seasons to assess regeneration and which would be supplemented with planting of local indigenous species in any areas that have not meet DSE revegetation planting standards.

Groundwater Extraction:

Both hydrological and ecological assessments have provided recommendations to monitor and manage groundwater extraction related impacts. These are intended to inform the development of a Bulk Entitlement (as per Part 4 of the *Water Act 1989*) for the Project. The Bulk Entitlement is the regulatory instrument through which groundwater extraction volumes, pumping regimes and associated impacts will be managed. The Bulk Entitlement will need to be responsive to future monitoring of hydrogeological parameters and ecological attributes. A full outline of these recommendations, has been included in Section 8.4 of the supporting documentation.

Other information/comments? (eg. accuracy of information)

The information presented in this section has been prepared by suitably qualified specialists.

There is a high level of confidence in the predictions of impacts related to proposed infrastructure.

The scope of assessment and predictions of impacts to flora and fauna related groundwater extraction, are dependent on the predictions of the groundwater numerical model and associated uncertainties. Therefore, there is a moderate level of confidence in the predictions of impacts to flora and fauna related groundwater extraction.

The key flora and fauna issues related to groundwater extraction have been identified and the potential impacts assessed with some certainty – the key conclusion being that these are run-off driven systems. It is considered that changes induced by the LEVF extraction are likely to be relatively minor rather than severe but there is less certainty as to the precise extent and nature of the change.

So while significant impacts are not anticipated from LEVF extraction, the hydrogeological and ecological interactions are complex and many uncertainties and information gaps remain. A precautionary approach, particularly to the initial pumping regime, is recommended. This would allow for the uncertainties to be addressed and avoid the possibility of significant or irreversible biological impacts. Monitoring will be essential to confirm the conclusions of the current assessments, refine the numerical groundwater model and manage potential groundwater extraction related impacts.

13. Water environments

Will the project require significant volumes of fresh water (eg. > 1 GI/yr)?

NYD No Yes If yes, indicate approximate volume and likely source.

Barwon Water are proposing to extract 7000 ML/year from the Lower Eastern View Formation aquifer system, via the Anglesea Borefield.

This volume is based upon the review of Victorian groundwater resources undertaken as part of CRSWS that suggested the potential yield from the LEVF aquifer system might be in the order of 7,000 ML/year. Thus, an annual extraction of 7,000 ML/year has been assumed for the purposes of groundwater modelling and infrastructure design.

Will the project discharge waste water or runoff to water environments?

NYD No Yes If yes, specify types of discharges and which environments.

Water containing fine sediments will be produced through the construction of the bores, this is referred to herein as development water. The two test production bores will be tested for 4 to 6 weeks and will each produce around 5 ML/day of raw groundwater, this is referred to herein as test pump water.

Development and test pump water will be contained onsite during construction. Management measures will be implemented to prevent run-off to nearby water environments (namely the Anglesea River) during construction. Development water from the southern borefield will be discharged to the Anglesea River, via Alcoa's Ash Pond No.2, in accordance with Alcoa's EPA discharge license. Development and test pump water from the northern borefield will be discharged to the decommissioned earthen basin onsite. Test pump water from the southern borefield will be transferred to Alcoa for use in their power plant.

Proposed reuse and disposal strategies for development and test pump water are provided in more detail in section 16 of this form.

Are any waterways, wetlands, estuaries or marine environments likely to be affected?

NYD No Yes If yes, specify which water environments, answer the following questions and attach any relevant details.

Water environments affected by infrastructure

- ▶ There are a total of 15 waterways intersected by the proposed pipeline – refer Figure 7.2 of the supporting documentation; and
- ▶ Construction of bores in the southern borefield is in the vicinity of the Anglesea River – refer section above re: run-off and discharge of wastewater.

Water environments affected by groundwater extraction

Surface features currently receiving baseflows from the Lower and the Upper Eastern View Formation aquifer systems (subject to reduced baseflows through extraction) comprise the Anglesea and Salt Creek Swamplands and the upper reaches of these catchments, which directly overlie parts of the LEVF and UEVF aquifers.

Are any of these water environments likely to support threatened or migratory species?

NYD No Yes If yes, specify which water environments.

Refer to section 12 of this form for details on migratory species.

Refer to section 12 of this form for details of threatened aquatic fauna species.

Are any potentially affected wetlands listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'?

NYD No Yes If yes, please specify.

There are no Ramsar sites identified within 10 km of the Project area. The groundwater management areas relevant to the Project are not connected to Ramsar sites (refer to the Hydrogeological report in Appendix G of the supporting documentation for details). The nearest Ramsar sites are:

- ▶ Port Phillip Bay (Western Shoreline) and Bellarine Peninsula – the nearest parts of this Ramsar site to the project area is Reedy Lake and Lake Connemara, which are approximately 25 km to the northeast of Anglesea.
- ▶ Western District Lakes - Lake Coraragamite is located about 17 km to the northwest of the Wurdee Boluc Reservoir.

Could the project affect streamflows?

NYD No Yes If yes, briefly describe implications for streamflows.

As discussed in section 11 of this form:

- ▶ The model water balance suggests that baseflow to creeks on LEVF outcrop areas may be reduced by around 1.2 ML/day, 0.7 ML/day of which is related to the proposed borefield operation and the remainder due to mine deepening. These predictions are considered to be conservative (refer Section 6.2.2 of the supporting documentation).
- ▶ Many creeks in the area (i.e. Salt Creek) are ephemeral, and the reduction in baseflow to these ephemeral stretches may result in the creek drying out more rapidly in the summer months and being drier for a longer period before surface flows occur in wetter seasons.
- ▶ Breakfast Creek Tributary and a section of Breakfast Creek may be perennial (or have permanent pools), although impact upon baseflow is expected to be minimal as the predicted drawdown cone in these areas is less than 0.1 m. In addition, in this area an unknown, but probably significant proportion of the baseflow is from the Otway Group bedrock, which will not be impacted or reduced by drawdown in the LEVF.
- ▶ In the upper reaches of the Anglesea River, drawdown of less than 0.1 m is predicted over the majority of the LEVF outcrop area, however there is a stretch near the MEVF/LEVF boundary where drawdown of between 0.1 to 1 m is predicted. This drawdown may impact on the level of the pools observed in this area.

The ecological implication of impacts to streamflows have been summarised in section 11 of this form and are detailed in Section 8 and Appendices D and N of the supporting documentation.

Could regional groundwater resources be affected by the project?

NYD No Yes If yes, describe in what way.

Yes - the objective of the Project is to extract groundwater from the LEVF aquifer system.

- ▶ **Impacts to other users:** Currently, there is little groundwater extraction from the LEVF aquifer. The borefield is predicted to adversely impact one existing stock and domestic bore and one industrial bore, however their current status (usage and existence) requires confirmation. Adverse impacts to Alcoa's operational bores are not expected.
- ▶ **Impacts to other Groundwater Management Areas (GMA's):** There are no impacts likely for the adjacent Gerangamete GMA.
- ▶ **Sustainable yield:** Extraction of 7,000 ML/year appears sustainable over a 50-year period, under the average climate change scenario assessed, based on predicted drawdown and

assessment of potential impacts under the scenario that Alcoa continues extraction from the UEVF and the scenario that Alcoa ceases extraction in 2016. Under climate change effects, the risk to the sustainability of the aquifer to provide 7,000 ML/year increases over time. If more extreme climate change occurs rather than the average focussed upon in the assessment, the time frame in which the aquifer will provide 7,000 ML/year may be reduced to less than 50 years. If Alcoa ceases groundwater extraction from the UEVF in 2016, there is less risk to the sustainability of the aquifer system while pumping at 7,000 ML/year under either climate change scenario.

Could environmental values (beneficial uses) of water environments be affected?

NYD No Yes If yes, identify waterways/water bodies and beneficial uses (as recognised by State Environment Protection Policies)

Potential for saline intrusion

Based on current conservative assumptions, with regards to the location of saline groundwater wedge in the aquifer, the model does suggest some potential for saline intrusion over time. Despite this result, it is still considered unlikely as there has been no evidence of saline intrusion into the UEVF aquifer during long term pumping by Alcoa. Monitoring of groundwater quality, in the LEVF aquifer, on the coast during pumping will be required to further address this potential impact.

Potential for inter-aquifer flow

Results from both mine development scenarios suggest that groundwater extraction from the LEVF aquifer is likely to result in increased downward vertical leakage of groundwater from the UEVF aquifer to the LEVF aquifer through the intervening MEVF aquitard. The induced leakage has the potential to affect groundwater quality in the LEVF aquifer since groundwater salinity in the UEVF aquifer is typically higher, around 800-1200 mg/L TDS compared to generally less than 500 mg/L TDS in the LEVF. Assuming that the salinity of the groundwater does not change as it passes through the MEVF, the water drawn from the LEVF boreholes may have a salinity rising to around 722 mg/L in the long-term. This is still below the 1,000 mg/L TDS concentration that is considered acceptable for drinking water purposes under the SEPP (Groundwaters of Victoria, 1997).

It is considered likely that groundwater quality within the LEVF will remain within Segment A as defined in the SEPP. However monitoring is recommended – refer Section 8.4 of the supporting documentation.

Could aquatic, estuarine or marine ecosystems be affected by the project?

NYD No Yes If yes, describe in what way.

Effects to aquatic and estuarine ecosystems related to infrastructure include the following:

- ▶ Installation of the proposed pipeline across waterways is considered to be short term (construction phase only), low risk and generally manageable in accordance with CMA guidelines implemented through the Environmental Management Plan (EMP).
- ▶ The crossing of Anglesea River does however pose some risk, as acid sulphate soils are known in this area. An aerial crossing is proposed at this point to minimise impacts and appropriate management measures will be implemented via the EMP.
- ▶ The construction of bores in the vicinity of the Anglesea River and potential for run-off and accidental release of development and/or test pump water poses some risk, however can be managed. Refer 16 of this form for details of the proposed reuse/disposal of development and test pump water.

Refer mitigation measures outlined below and further detailed in Section 11 of the supporting

documentation.

Effects to aquatic and estuarine ecosystems related to groundwater extraction include the following:

Reduced baseflows to the creeks/ivers in the Lower and Upper EVF outcrops and the extensive swamplands of the lower reaches of Anglesea River (also known as Marshy Creek) and Salt Creek, are potential sites for the surface expression of groundwater and thus potentially affected by drawdown.

This has been the subject of hydrogeological assessment extensive ecological survey – refer Section 8 and Appendices D, G and N of the supporting documentation). Refer section 11 of this form for details on the expected impact to these systems.

Is there a potential for extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term?

No Yes If yes, please describe. Comment on likelihood of effects and associated uncertainties, if practicable.

There is potential for effects on the health and biodiversity of the aquatic ecosystems over the long term through extraction from the LEVF and associated reduction in baseflows to these systems. These systems include the Anglesea and Salt Creek Swamplands and the upper reaches of these catchments, which directly overlie parts of the LEVF and UEVF aquifers. However the predicted reduction in baseflows as a result of the proposed extraction from the LEVF is relatively minor and considered incremental in the context of predicted effects due to climate change.

Refer section 11 of this form, for a summary of potential effects to aquatic ecosystems related to groundwater extraction.

Is mitigation of potential effects on water environments proposed?

NYD No Yes If yes, please briefly describe.

Mitigation of effects related to proposed infrastructure

Mitigation of effects related to construction of the pipeline across waterways and construction activities in the vicinity of waterways are outlined in full in the EMP Framework included in Section 11 of the supporting documentation. These measures include recommendations of the aquatic assessment undertaken for waterway crossings (refer Section 7.4 of the supporting documentation) and the guidelines stipulated by the Corangamite CMA.

Mitigation of effects related to groundwater extraction

Mitigation of effects to water environments related to groundwater extraction will be by adjusting pumping regimes and/or rates to limit the drawdown cones. However further monitoring of groundwater, surface water and associated ecological systems is required to better understand these systems and determine appropriate pumping regimes and rates and mitigation.

Recommendations have been made to monitor hydrogeological parameters and ecological attributes – refer Section 8.4 of the supporting documentation.

Monitoring of groundwater levels and surface water flows:

Monitoring of groundwater levels and surface water flow will be designed to monitor drawdown in the LEVF, UEVF and swamp watertable aquifers, and surface water flows at key locations. The data collected will be used to:

- ▶ Provide additional baseline data prior to pumping and address current datagaps; and

- ▶ Allow drawdown to be recorded during pumping and compared to predicted drawdowns.

Groundwater quality monitoring adjacent the coast and in the extraction bores will also be instigated to monitor for saline intrusion and water quality changes.

Additional information gathered from the monitoring program shall be incorporated into the numerical model to improve the understanding of recharge and discharge processes within the swamp areas and their interaction with the UEVF and LEVF aquifers. Once these are established with an improved level of confidence, appropriate extraction rates and pumping regimes can be determined.

Monitoring of aquatic ecosystems:

Monitoring of aquatic ecosystems includes macroinvertebrate and fish surveys, flow gauging, mapping and monitoring of pools and wetlands. The Breakfast Creek Tributary, will be a focus of these monitoring activities given the sensitivity of the fish population sampled, to reduction in flow.

Other information/comments? (eg. accuracy of information)

The information presented in this section has been prepared by suitably qualified specialists.

Hydrogeology

The numerical modelling and hydrogeological conceptualisation both contain many assumptions based upon limited data, which affect the level of confidence in the impact assessment. The assumptions and data limitations are outlined in detail in Section 7 of the Hydrogeological Assessment (Appendix G of the supporting documentation). There are many uncertainties that will never be resolved, however, a conservative approach has been taken along with the use of professional judgement. The impact assessment is a best estimate using the available data, and modelling has been completed in compliance with the Groundwater Flow Modelling Guideline (MDBC, 2000).

Uncertainties around groundwater-surface water interaction relate to the primary lack of data, however, for licensing purposes a conservative approach has been adopted in the numerical modelling and assessment of impacts. Furthermore, comprehensive monitoring and mitigation measures have been proposed in order to confirm conclusions made to date, identify and mitigate adverse impacts.

Aquatic Ecology

This study has provided vital information towards establishing the current ecological state of the Eastern View Formation and is the most comprehensive aquatic survey undertaken within the study area to date. As a consequence, the current study provides a solid basis for ongoing monitoring. A monitoring strategy has recommended to better understand natural variation in the system and to detect adverse impacts associated with extraction from the LEVF.

14. Landscape and soils

Landscape

<p>Has a preliminary landscape assessment been prepared? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, please attach.</p> <p>A landscape and visual impact assessment has being undertaken for the Project. Refer to Section 7.7 or Appendix M of the supporting documentation.</p>
<p>Is the project to be located either within or near an area that is:</p> <ul style="list-style-type: none"> <p>Subject to a Landscape Significance Overlay or Environmental Significance Overlay? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, provide plan showing footprint relative to overlay.</p> <p>There are no Landscape Significance Overlays in any of the Project area, but an Environmental Significance Overlay intersects part of the Transfer Pipeline. Refer Figure 4.2 of the supporting documentation.</p> <p>Identified as of regional or State significance in a reputable study of landscape values? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, please specify.</p> <p>Great Otway National Park, Angelsea Heath and the Great Ocean Road are considered to have State landscape values, according to the <i>Coastal Spaces Landscape Assessment Study</i> (Department of Sustainability and Environment, 2006) and <i>The Great Ocean Road Landscape Assessment Study</i> (Department of Sustainability and Environment, 2004).</p> <p>Within or adjoining land reserved under the <i>National Parks Act 1975</i> ? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, please specify.</p> <p>Project infrastructure is proposed within a small section and adjacent to the Great Otway National Park (refer Figure 3-3 of the supporting documentation). Creeks/rivers subject to reduced baseflows, particularly within the LEVF outcrop, are located within the Great Otway National Park (refer Figure 7).</p> <p>Within or adjoining other public land used for conservation or recreational purposes? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, please specify.</p> <p>The Project area includes the Great Otway National Park and the Anglesea Heath. Bore site 4 in the southern borefield is proposed on a site currently utilised by the Anglesea and District Riding Club, however operation of the bore is not expected to interfere with their activities.</p>
<p>Is any clearing vegetation or alteration of landforms likely to affect landscape values? <input type="checkbox"/> NYD <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes If yes, please briefly describe.</p>
<p>Is there a potential for effects on landscape values of regional or State importance? <input type="checkbox"/> NYD <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Please briefly explain response.</p>
<p>Is mitigation of potential landscape effects proposed? <input type="checkbox"/> NYD <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes If yes, please briefly describe.</p> <p>Based on the visual impact assessment, the proposed Pre-treatment Plant and Transfer Pump Station site is located in a moderate - high scenic quality landscape character type. However there will be minimal or an acceptable level of impact to the landscape due to the fact that the vantage points to the pre-treatment site and borefield site locations occur in landscape settings that are already visually modified.</p> <p>With mitigation, the impacts identified will be absorbed into the landscape post construction. The</p>

maintenance of these mitigation measures post construction will facilitate ongoing visual absorption of the infrastructure into the surrounding context.

Refer Appendix M of the supporting documentation for a full explanation of landscape areas and Landscape Management Zone Visual Quality Objectives, potential impacts and mitigation measures. Key aspects and associated mitigation measures are outlined below.

Key Aspect	Mitigation Measure
Lime silo (pre treatment plant component) will be visible from Forest Road on approach from Great Ocean Road.	Select a non-reflective material and colour for the lime silo that is easily absorbed into the foreground-background tones of the existing landscape.
Production bores surrounded by Cyclone Fence 1.8 metres high 400m2 in circumference will be visible from Forest Road and Coalmine Road.	Screen planting in locations surrounding the perimeter of the fencing in an informal more 'naturalistic' configuration. Additional screen planting along Forest Road buffer and on the south side of Coalmine Road.
Other information/comments? (eg. accuracy of information)	
The information presented in this section has been prepared by suitably qualified specialists.	
The landscape and visual assessment of this Project has referenced the Victorian Visual Management System (VMS). The VMS was originally developed by the former Forest Commission Victoria for assessing visual/landscape impacts of forestry, but has also been used for proposed developments where there is potential visual impact and associated public and landscape sensitivity.	

Soils

Is there a potential for effects on land stability, acid sulphate soils or highly erodible soils?

NYD No Yes If yes, please briefly describe.

A geotechnical assessment has been undertaken – refer Section 7.2 of the supporting documentation.

During the field investigation, soils displaying field indicators for potential acid sulfate generation were encountered on the western bank of the Anglesea River. Sampling and laboratory testing was undertaken on these soils in order to quantitatively assess their potential for acid sulfate generation. The laboratory results indicated that both Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS) are present at this location.

As a result, it is proposed that the Borefield Collection Pipeline be attached to the bridge across the River at this point. This will minimise the exposure of acid sulfate soils and the risk of runoff of acid waters into the adjacent Anglesea River. Where acid sulfate soils are exposed, management measures in accordance with EPA Publication 655 and the Industrial Waste Management Policy (Waste Acid Sulfate Soils), Victorian Government Gazette, August 1999 (EPA Act 1970, Act No. 8056/1970) have been referenced in the EMP Framework – refer Section 11 of the supporting documentation.

The geotechnical assessment did not identify any potential for effects on land stability or highly erodible soils.

Are there geotechnical hazards that may either affect the project or be affected by it?

NYD No Yes If yes, please briefly describe.

A formal qualitative risk assessment was not conducted as part of the current geotechnical assessment, however the Project is considered to pose a low geotechnical risk. The primary geotechnical risk is the exposure of acid sulphate soils during construction, and runoff of acid waters into the adjacent Anglesea River. The presence of fill and water inundated soils at the Anglesea Basin site has been managed by a soil replacement plan, in conjunction with rigid structural foundations.

Other information/comments? (eg. accuracy of information)

The information presented in this section has been prepared by suitably qualified specialists.

The geotechnical assessment included desktop, and field assessments. The location of investigation test sites for the geotechnical assessment was constrained by cultural heritage sensitivity, access restrictions due to inclement weather and the need to minimise the environmental impact imposed by the investigation. Some information gaps have been noted (refer Section 7.2 of the supporting documentation) however these are more relevant to technical aspects than environmental effects.

15. Social environments

Is the project likely to generate significant volumes of road traffic, during construction or operation?

NYD No Yes If yes, provide estimate of traffic volume(s) if practicable.

A Traffic Impact Assessment (TIA) has been undertaken for the Project. Refer to Appendix L of the supporting documentation for the full TIA report.

- ▶ The TIA concluded that the Project is not expected to cause any road safety concerns during the operation phase and is supported on traffic grounds.
- ▶ The key recommendation arising from the TIA was that Traffic Management Plans be prepared for the construction activities associated with the PTP/TPS site, the bore sites and the pipeline.

Is there a potential for significant effects on the amenity of residents, due to emissions of dust or odours or changes in visual, noise or traffic conditions?

NYD No Yes If yes, briefly describe the nature of the changes in amenity conditions and the possible areas affected.

Dust and Odour

A Dust and Odour Assessment was undertaken – refer Section 7.9 of the supporting documentation.

Construction activities may generate localised emissions to air of crustal dust. This impact is not considered a significant effect. Appropriate measures have been proposed to manage and mitigate dust impacts are outlined in full in the EMP Framework – refer Section 11 of the supporting documentation.

For the purposes of the odour assessment, it has been assumed that the odour impacts during operation will be limited to potential odour from the Pre-treatment Plant. It has been assumed that during operation, an amount of Hydrogen Sulphide (H₂S) will be released when the bore water is aerated. The purpose of aerating the water is to increase the pH by reducing the amount of Carbon Dioxide (CO₂) dissolved in the water. Aeration of the water will also release sulphur compounds, dissolved in the bore water as Sulphate (SO₄). Sulphate on its own is not odorous, however a percentage of the Sulphate will be converted to H₂S during the aeration process, which

will cause odour. The level of odour generated will depend on the amount of Sulphate present in the pre-aerated water.

It has been recommended that groundwater from the test bores be analysed for labile H₂S to determine if the buffer to the nearest sensitive receptor is acceptable. If this buffer is found to be unacceptable based on the labile H₂S present, then it is recommended that the odorous emissions to air (once determined) be modelled using site representative meteorology to determine if other odour mitigation measures are needed.

Visual

Refer section 14 of this form for relevant details.

Noise

A Noise Impact Assessment and associated Drill Rig Noise Barrier Assessment have been undertaken (refer Appendix F of the supporting documentation).

During operation, it is anticipated that only the Pre-treatment Plant and Transfer Pump Station will be significant sources of noise. The bore pumps will be electric, down-hole, submerged units and are expected to be inaudible at ground level. Upon project completion, it is expected that the bore pumps, Pre-treatment Plant and Transfer Pump Station will operate 24 hours per day.

The key conclusions of the Noise Impact Assessment are:

- ▶ Operational noise emissions from the Pre-treatment Plant and Transfer Pump Station (Anglesea Basin site) are expected to meet the applicable operational noise criteria at the nearest sensitive receptors, provided that equipment noise emissions are considered during the design of the proposed facility; and
- ▶ Construction noise has the potential to adversely impact upon nearby sensitive receptors (residences) in the southern borefield particularly if construction/drilling of the bores are undertaken during evening and/or night-time periods.

A number of noise management measures have been recommended to mitigate construction noise impacts to sensitive receptors (residences) in the southern borefield. For the purposes of developing specifications for barrier to attenuate noise from the drill rig at the southern borefield, a Drill Rig Noise Barrier Assessment was also undertaken. Key recommendations included in full in the EMP Framework - refer Section 11 of the supporting documentation.

Traffic

Refer to the previous question for relevant details.

Is there a potential for exposure of a human community to health or safety hazards, due to emissions to air or water or noise or chemical hazards or associated transport?

NYD No Yes If yes, briefly describe the hazards and possible implications.

For information regarding odour and noise emissions, refer above.

A preliminary Occupational Health and Safety Assessment has been undertaken – refer Section 10.6 of the supporting documentation. This assessment concluded the following:

In order to achieve the Project's occupational health and safety (OH&S) objectives during construction and to address the scope of project related activities; a Project OH&S Plan will be developed, implemented and managed by the Contractor, for the construction phase. The Project OH&S Plan will provide a framework for identifying Project related activities that may have a negative impact on the health and safety of all people, plant and property; and managing these activities. Such a framework will need to be flexible and able to adapt to the changing project

phases, work requirements, legislation and standards, as required.

Chemicals associated with the operation of the Pre-treatment Plant include; Lime, Potassium Permanganate, Polyelectrolyte. Hypochlorite (already stored on site). These chemicals will be transported and stored at the site in accordance with dangerous goods regulations. Storage and handling of all chemicals and hazardous substances will be in accordance with Barwon Water's OH&S system SafeAs Section C2 – Chemical Management.

The nearest residence to this site is located ~900m from the site boundary.

Is there a potential for displacement of residences or severance of residential access to community resources due to the proposed development?

NYD No Yes If yes, briefly describe potential effects.

Are non-residential land use activities likely to be displaced as a result of the project?

NYD No Yes If yes, briefly describe the likely effects.

Where the pipeline easement is in private land – non-residential (mostly agricultural) land use activities will be displaced during construction. This will be limited to the construction corridor only. Once reinstated, the pipeline easement is not expected to displace existing land use activities. However property development (construction of buildings) may be impeded by the location of the easement. The pipeline has been aligned along property boundaries for this reason and selected in consultation with landowners in order to minimise potential for such impacts.

Bore site 4 is located on unreserved crown land, which the Anglesea and District Riding Club have a licence to use for their activities. The clubs activities will be displaced during construction however through consultation with the club, Barwon Water have agreed a location which will not displace their activities during operation.

Do any expected changes in non-residential land use activities have a potential to cause adverse effects on local residents/communities, social groups or industries?

NYD No Yes If yes, briefly describe the potential effects.

Is mitigation of potential social effects proposed?

NYD No Yes If yes, please briefly describe.

A Social and Economic Impact Assessment of the Project has been undertaken – refer Section 6 of the supporting documentation.

The social impacts of the base case 'no Project' scenario are potentially highly significant and negative based upon predicted population growth and current water storage shortages in the region.

Potential social impacts associated with the Project have been identified, most of which are negative in nature, however:

- The Project will result in the substantial positive impact of greater water security, and it's associated benefits;
- A majority of the potentially negative impacts are associated with the construction phase and are thus short-term and localised; and
- There are strategies in place to manage and mitigate these impacts (Environmental Management Plan and further consultation).

The comprehensive consultation strategy implemented for the Project has ensured input from a wide range of stakeholders. This input has been effective in developing a number of mitigation strategies thus far and will be utilised going forward to further minimise negative impacts and ensure impact mitigation measures are effected.

Other information/comments? (eg. accuracy of information)

The information presented in this section has been prepared by suitably qualified specialists.

The social impact assessment was based on a desktop review, knowledge of impacts and consultation activities undertaken for the Project.

Cultural heritage**Have relevant Indigenous organisations been consulted on the occurrence of Aboriginal cultural heritage within the project area?**

- No If no, list any organisations that it is proposed to consult.
 Yes If yes, list the organisations so far consulted.

A cultural heritage assessment (refer Section 7.1 of the supporting documentation) has been undertaken and a Cultural Heritage Management Plan (CHMP) prepared. The CHMP (AAV Plan Identifier 10043, included as Appendix E of the supporting documentation) was prepared in accordance with the *Aboriginal Heritage Act 2006* and was approved on the 21st September 2007. The following groups were consulted during the preparation of the CHMP.

Wathaurong Aboriginal Co-operative (WAC)

The cultural heritage assessment commenced prior to the enactment of the *Aboriginal Heritage Act 2006* and consultation with the local Aboriginal community was initially conducted under the previous legislation. Under the Regulations of the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, Anglesea falls within the boundaries of the *Wathaurong Aboriginal Co-operative (WAC)*.

As well as its status under the former acts, at the commencement of the current assessment the WAC indicated its intention to apply to become a Registered Aboriginal Party (RAP).

A meeting was held with representatives from GHD, Barwon Water, the Co-operative's CEO Mr. Trevor Edwards and Cultural Heritage Officer Trevor Abrahams, and Brendan Marshall (TerraCulture). Representatives from the WAC participated in all archaeological fieldwork carried out during the project and monitored other ground disturbing activities such as the geotechnical investigations. Draft Reports with Management Recommendations were sent to the WAC for comment. The Contingency Planning was discussed at length with Trevor Edwards and Trevor Abrahams.

Consultation with this group is further detailed in the CHMP.

Wathaurong Native Title Group (Traditional Owners)

At the completion of the survey and prior to the subsurface testing, a meeting was held with AAV's Barwon Region Staff (Barwon Water GHD and the advisors from TerraCulture in attendance). At this meeting AAV advised that a second Aboriginal group who had an interest in the Aboriginal Cultural Heritage within the study area should be consulted – the *Wathaurong Native Title Group*. Neither this group, nor the WAC has any legal status under the current legislation and in the absence of a RAP/S the Secretary assumes responsibility. However, Barwon Water has a long relationship with the WAC and naturally approached this organisation in March 2007. AAV later advised that they would contact this group to advise them of the Project.

What investigations of cultural heritage in the project area have been done?

(attach details of method and results of any surveys for the project & describe their accuracy)

As outlined above, a Cultural Heritage Management Plan (CHMP) has been prepared and approved for the Project.

The development of this CHMP involved a desktop review, a pedestrian survey of the construction footprint (including all sites and alignments) and sub-surface testing in areas of sensitivity.

Is any Aboriginal cultural heritage known from the project area?

NYD No Yes If yes, briefly describe:

- Any sites listed on the AAV Site Register
- Sites or areas of sensitivity recorded in recent surveys from the project site or nearby
- Sites or areas of sensitivity identified by representatives of Indigenous organisations

Whilst a broad desktop review for the purposes of guiding site and alignment selection, once the preferred sites and alignments were selected a review of registered Aboriginal archaeological sites in relation to the proposed works was undertaken. The table below lists the registered Aboriginal archaeological sites (prior to field survey for this Project) in the vicinity of the proposed works.

Registered Aboriginal archaeological sites in the vicinity of the proposed works

Project Area	Registered sites within the area	Number
Northern Borefield	7721/696	1
Southern Borefield	7721/502, 503, 521, 619, 677, 678, 720, 730, 731, 732, 733,	11
Collection Pipeline	7721/0449, 0694, 0645, 0696	4
Transfer Pipeline	7721/0677, 0678, 693,0692,0689,0711,	6

As mentioned above, most of the registered Aboriginal archaeological sites within the Anglesea Borefield Project area were recorded during the surveys of the then Angahook-Lorne State Park (Marshall 1995) and the Anglesea Heath (Marshall and Webb 2005) where the authors conclude:

- That the area contains many hundreds of Aboriginal archaeological sites;
- Most of these sites occur in surface or near-surface deposits that are presently covered in native vegetation;
- The landforms most sensitive for Aboriginal archaeological material are ridges, spurs and the ground adjacent to the two major creeks and other sources of water;
- Most of these sites occur as low density artefact scatters and consist of small numbers of formal and informal tools and associated debitage;
- These tools are made on a variety of stone types but mostly silcrete that has been imported into the area;
- While an age cannot be ascribed to these sites, they are probably the product of the occupation of the area by many generations of Aboriginal people over a long period of time; and
- These archaeological sites probably are the result of 'temporary' camps made up of small numbers of people targeting specific resources within the heath.

The registered Aboriginal archaeological sites listed above are all low density stone artefact

scatters located on unsealed roads and tracks where these sample ridgelines and water courses. Most consist of 1-2 pieces of artefactual stone on the ground's surface.

Within the heath and other local bushland reserves, the discovery of stone artefacts is dependent on many factors including ground surface visibility, ground exposure (which are two different measures of AAV's site cards) and local weather conditions, particularly the frequency of rain.

Notwithstanding the limitations of field surveys, the site distribution patterns within the Anglesea Heath are a product of circumstances that were current at or near the time of their recording. Many of the sites are redeposited, because of downslope fluvial induced erosion. The relationship between these artefacts and the deposits from which they originally derived is usually not apparent and could not be known without the removal of the adjacent native vegetation.

At the completion of the desktop assessment, on the basis of registered site locations and as far as it was possible to determine, the proposed works will not impact any significant registered Aboriginal archaeological sites.

Effects of the Activity on Aboriginal Archaeological Sites

There are a number of registered Aboriginal archaeological sites within the Anglesea Borefield Project study area that have been or will be harmed by the proposed activity.

As documented during the CHMP, none of these stone artefact sites are significant enough (in scientific terms) to warrant a change in the siting of the bores, pre-treatment plant, or in the alignments of the collection and transfer pipelines; all are low in density, and are located in sedimentary contexts which have been disturbed during the clearing of the land (from forest to pasture) and from subsequent development including tree plantation, quarrying, road construction and farming.

Neither the pedestrian survey nor the subsurface testing was exhaustive in the sense that this fieldwork accounts for all the possible Aboriginal archaeological material within the Anglesea Borefield Project subject land. The fieldwork established the general nature of the record within the activity area and provides for specific locations where low density stone artefact sites have been found. There is a probability that other Aboriginal archaeological material will be uncovered and therefore harmed during the proposed activity. At the same time, further subsurface testing prior to the commencement of works would not necessarily result in the discovery of any significant Aboriginal archaeological sites.

Through field surveys, new sites were discovered. As currently known, none of the Aboriginal archaeological sites discovered during the field surveys and subsurface testing are significant enough to warrant changes in the engineering or siting of the proposed works. Through the digging of the trenches, installation of the pipeline, machine movement and other general construction activities the Project will disturb the following Aboriginal archaeological sites:

- ▶ Anglesea Basin 1 (7721/0855);
- ▶ Anglesea Basin 2 (7721/0856);
- ▶ Old Tip Road Stone Artefact Scatter (7221/0854);
- ▶ Nobles Road 1 (7721/0852); and
- ▶ Dangers Road 1 (7721/0853).

The Anglesea Basin sites were discovered during the early stages of the fieldwork. Consent was sought from the WAC and granted to BW to disturb these two sites prior to the enactment of the new Act.

Are there any cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the *Heritage Act 1995* within the project area?

NYD No Yes If yes, please list.

Is mitigation of potential cultural heritage effects proposed?

NYD No Yes If yes, please briefly describe.

Recommendations for Management of Aboriginal Cultural Heritage have been outlined in detail in the CHMP for the Project, which is included as Appendix E of the supporting documentation.

Other information/comments? (eg. accuracy of information)

The information presented in this section has been prepared by suitably qualified specialists.

The CHMP notes the following with regards to the accuracy of information:

Neither the pedestrian survey nor the subsurface testing was exhaustive in the sense that this fieldwork accounts for all the possible Aboriginal archaeological material within the Anglesea Borefield Project subject land. The fieldwork established the general nature of the record within the activity area and provides for specific locations where low density stone artefact sites have been found. There is a probability that other Aboriginal archaeological material will be uncovered and therefore harmed during the proposed activity. At the same time, further subsurface testing prior to the commencement of works would not necessarily result in the discovery of any significant Aboriginal archaeological sites.

16. Energy, wastes & greenhouse gas emissions

What are the main sources of energy that the project facility would consume/generate?

- Electricity network. If possible, estimate power requirement/output
- Natural gas network. If possible, estimate gas requirement/output
- Generated on-site. If possible, estimate power capacity/output
- Other. Please describe.

Please add any relevant additional information.

Electricity from the network will be used to power the production bore pumps, the Pre-treatment Plant and Transfer Pump Station. Upgrades and extensions will be required to the local electricity distribution network to provide the required load to the Bores, Pre-treatment Plant and Transfer Pump Station. The construction of all power supply assets to the sites is the responsibility of Powercor. Preliminary discussions have been held with Powercor.

What are the main forms of waste that would be generated by the project facility?

- Wastewater. Describe briefly.
- Solid chemical wastes. Describe briefly.
- Excavated material. Describe briefly.
- Other. Describe briefly.

Please provide relevant further information, including proposed management of wastes.

Wastewater

Development water will be produced during construction of the bores and test pump water will be produced during testing of test production bores. The proposed disposal/reuse of this water is described in section 13 of this form above.

Solid chemical wastes

Operation of the Pre-treatment Plant will result in the formation of an iron and manganese rich sludge forming on the base of the 80 ML earthen basin as a result of the lime dosing and settling of water. The frequency of removal of this sludge is presently unknown but based on the Pre-

treatment Plant for the Barwon Downs Borefield, is anticipated to be approximately once every ten years.

Excavated Material

Drilling Sediments/Spoil

Drilling sediments/spoil will be produced during construction of the bores. This is the sand and clay material extracted from the borehole. It is normally mixed with drilling mud and is a semi-solid material, however dries to a solid material. The sediments/spoil will be placed into a mud pit excavated for this purpose. The mud pit will need to be excavated on a regular basis to make room for further sediments/spoil. It is proposed that this waste will be disposed to an approved landfill. Discussions with the Anglesea Landfill confirm this is a viable local disposal option.

Drilling sediments/spoil will be transported to landfill by an eductor tanker truck.

Drilling Muds

Drilling muds will be produced during construction of the bores. This is a heavy liquid that keeps the bore open and brings silts and sands to the surface during drilling. The drilling muds are polymers, commonly containing bentonite and/or montmorillonite (clays). At certain stages of the drilling, waste mud will need to be emptied from the mud pits and a new batch of mud mixed. It is proposed that waste mud will be disposed to an approved landfill, most likely the Anglesea Landfill. Discussions with the Anglesea Landfill confirm this is a viable local disposal option.

Drilling muds will be transported to landfill by a tanker truck.

Acid Sulphate Soils

Acid sulphate soils are known in the vicinity of the Anglesea River. Whilst construction methods have been designed to avoid these soils, if they are encountered during construction and can't be reinstated, management and disposal methods should be in accordance with EPA Publication 655 and the Industrial Waste Management Policy (Waste Acid Sulfate Soils), Victorian Government Gazette, August 1999 (EPA Act 1970, Act No. 8056/1970).

Spoil affected by Cinnamon Fungus

Cinnamon Fungus has been mapped throughout the Anglesea Heath/Great Otway National Park area. It is difficult to define exactly what sections of the proposed alignment will be affected due to changes in the disease boundary with time. As such, for the purposes of management during construction of this Project, it will be assumed that the entire Anglesea Heath / Great Otway National Park area is infected. Prior to construction the relevant sections of the alignment will be sampled and tested for Cinnamon Fungus for the purposes of spoil disposal.

Other waste

Apart from cleared vegetation and spoil, a number of solid wastes will be generated during the construction of the Project. These may include: steel, timber and pipe off-cuts; cardboard, timber and plastic packaging; empty steel and plastic containers; wooden pallets; and construction worker food scraps. The quantity of construction waste has not been assessed. With the possible exception of empty steel and plastic containers, it is expected that all other types of waste would be classified as solid inert or putrescible waste. Depending upon the nature of the product they previously held, empty chemical containers might be classified as a prescribed waste.

Wastes that are not cost effective to segregate for recycling will be collected by a waste contractor for disposal at a local EPA-licensed landfill or transfer station.

What level of greenhouse gas emissions is expected to result directly from operation of the project facility?

- Less than 50,000 tonnes of CO₂ equivalent per annum
- Between 50,000 and 100,000 tonnes of CO₂ equivalent per annum
- Between 100,000 and 200,000 tonnes of CO₂ equivalent per annum
- More than 200,000 tonnes of CO₂ equivalent per annum

Please add any relevant additional information, including any identified mitigation options.

A Greenhouse Gas Assessment has been undertaken for the Project – refer Section 7.5 and Appendix K of the supporting documentation. This assessment estimates the life cycle greenhouse gas emissions for the Project from direct and indirect sources.

- ▶ The annual CO₂-e emissions generated from the operation of the Borefields and Pre-treatment Plant are 9,300 tCO₂-e.
- ▶ The estimated lifecycle greenhouse emissions for the Project are 250 ktCO₂-e.

Due to the assumptions made and the degree of accuracy in the calculations, the figures presented here should only be quoted to two significant figures. An uncertainty factor exists at this stage of design due to the assumptions made when estimating various inputs into the operational aspect of the greenhouse gas assessment.

Barwon Water's Greenhouse Gas Emissions Strategy is currently being developed in conjunction with VicWater and other Victorian water corporations. The Strategy will consider Barwon Water's total greenhouse gas emissions, including additional emissions associated with the Anglesea Borefield Project, and identify reductions considered on a business wide level rather than project-specific offsets. The objective of the Strategy is to reduce Barwon Water's overall greenhouse gas emissions and work towards a long-term aspirational target of carbon neutrality.

17. Other environmental issues

Are there any other environmental issues arising from the proposed project?

- No Yes If yes, briefly describe.

18. Environmental management

What measures are currently proposed to avoid, minimise or manage the main potential adverse environmental effects? (if not already described above)

- Siting: Please describe briefly

As discussed in Section 4 of this form, a process of desktop and field assessments, landowner and stakeholder consultation, use of a GIS multi-criteria analysis tool, facilitated the selection of preferred sites and alignments that avoided impacts to assets.

A detailed description of the site and alignment selection process is provided in the, *Site and Alignment Selection Report* - Appendix B of the supporting documentation.

- Design: Please describe briefly

The following key design alterations have been made to avoid and minimise environmental impacts of the Project:

- ▶ Aerial crossing of Anglesea River (at Coalmine Road) to minimise the risk of exposing acid sulphate soils and run-off of acid water to the River;
- ▶ Pre-chlorination at the Pre-treatment Plant to minimise the potential for odour.

- Environmental management: Please describe briefly.

An EMP Framework has been prepared, incorporating all recommendations relevant to the construction and operation of Project infrastructure. The Framework is included in Section 11 of the supporting documentation and includes measures for the:

- ▶ Protection of flora and fauna;
- ▶ Management of air quality and dust emissions;
- ▶ Management of noise emissions;
- ▶ Handling of fuels and chemicals;
- ▶ Prevention of erosion and sedimentation;
- ▶ Rehabilitation of disturbed areas; and
- ▶ Management of, spoil, weeds and plant diseases.

This Framework will inform the development of the EMP for the Project. The EMP will become a key reference document that converts the undertakings and recommendations of the environmental studies into a set of actions and commitments to be followed by Barwon Water and their contractors.

Other: Please describe briefly

Both hydrological and ecological assessments related to the impact of groundwater extraction have provided recommendations to monitor and manage groundwater extraction related impacts – refer Section 8.4 of the supporting documentation. These are intended to inform the development of a Bulk Entitlement (as per Part 4 (Section 34 – 48) of the *Water Act 1989*) for the Project. The Bulk Entitlement is the regulatory instrument through which groundwater extraction volumes, pumping regimes and associated impacts will be managed. The Bulk Entitlement will need to be responsive to future monitoring of hydrogeological parameters and ecological attributes.

19. Other activities

Are there any other activities in the vicinity of the proposed project that have a potential for cumulative effects?

NYD No Yes If yes, briefly describe.

In relation to the impacts of groundwater extraction, the following confounding effects have been considered in the current assessments and have the potential for cumulative effects:

- ▶ The impacts of previous peat fires on the ecosystems of the swamplands (refer Appendix D of the supporting documentation);
- ▶ Current and future extraction from the UEVF by Alcoa (refer Appendix G of the supporting documentation); and
- ▶ Climate change (refer Appendix G of the supporting documentation).

20. Investigation program

Study program

Have any environmental studies not referred to above been conducted for the project?

No Yes If yes, please list here and attach if relevant.

Has a program for future environmental studies been developed?

No Yes If yes, briefly describe.

A formal program for future environmental studies has not been developed. However various recommendations have been made for further investigation and monitoring.

Future environmental studies related to proposed infrastructure

It has been recommended that groundwater from the test bores be analysed for labile H₂S to determine if the buffer to the nearest sensitive receptor is acceptable. If this buffer is found to be unacceptable based on the labile H₂S present, then it is recommended that the odorous emissions to air (once determined) be modelled using site representative meteorology to determine if other odour mitigation measures are needed.

Future environmental studies related to groundwater extraction

Both hydrological and ecological assessments related to the impact of groundwater extraction have provided recommendations monitoring of hydrogeological parameters and ecological attributes of the system – these are outlined in section 8.4 of the supporting documentation. In addition to monitoring, the Hydrogeological Assessment has also recommended the following:

Regarding impacts on other users: The current status (usage and existence) of industrial use bore 46095 and domestic bore 46088 requires confirmation. Is in use, a baseline survey is recommended to assess the current condition of the bores. If significant interference does occur due to the proposed borefield pumping and cannot be easily managed through variation of the proposed daily volumes and pumping regimes, Barwon Water may implement measures to maintain continuity of supply to registered users.

Regarding subsidence: Barwon Water will obtain and assess any existing relevant survey data for the Alcoa Brown Coal Mine area and subsidence modelling will be completed following testing of soil samples recovered from the investigation boreholes.

Consultation program

Has a consultation program conducted to date for the project?

No Yes If yes, outline the consultation activities and the stakeholder groups or organisations consulted.

A Stakeholder Engagement Strategy was developed for the Project at its inception. This Strategy outlines a consultation program, designed to respond to the interests and concerns of stakeholders.

Five broad groups of stakeholders have been identified as having interests in this Project, including:

- Relevant government agencies, as represented by the Agency Reference Group established for the Project (and including Alcoa);
- Community groups, who have a high level of interest in the Project and are concerned about potential environmental impacts;
- Community stakeholders with general interests in the Project;
- Landowners along the pipeline route; and
- Barwon Water customers.

Appropriate communication mechanisms, consultative activities and responsibilities have been identified to respond to the interests of each of these groups. The following has been undertaken to date:

- A Project Information Centre (PIC) was established early in the planning phase (February 2007). The PIC includes a free-call number, email address and website and later a Project

office in Anglesea (June 2007).

- Two Community Information Bulletins have been issued.
- Media releases have been issued to the local press to provide updates and promote consultation activities such as the Project Information Days.
- An Agency Reference Group (ARG) was established for the Project in March 2007 comprising representatives of a number of government agencies. To date, the group has met on six occasions. The purpose of the ARG is to facilitate a streamlined approach to Project approvals. Focused meetings and site visits have also been held with certain representatives as required.
- Focused consultation and negotiation with landowners affected by the pipeline has been undertaken regarding creation of easements.
- Two Community Forums have been held with representatives of local interest groups. Focused meetings and site visits have also been held with certain representatives as required.
- Two Project Information Days have been held, open to the public.
- Focused meetings have been held with local environmental groups (Friends of the Eastern Otways, ANGAIR, Upper Barwon Landcare Network etc.), to discuss specific issues.
- Briefings to industry and local politicians have been made.

The seventh ARG meeting and two information sessions open to the public, will be held on Tuesday 19 February 2007, to provide an overview of the assessments undertaken to date.

Has a program for future consultation been developed?

NYD No Yes If yes, briefly describe.

A formal program has not been developed as such, however the following is proposed:

- The Agency Reference Group will be maintained throughout the construction phase of the Project to facilitate input from the relevant agencies.
- Targeted communication and consultation with community groups who have demonstrated a high level of interest such as; Friends of the Eastern Otways, ANGAIR, Geelong Environment Council, Wurdale and Upper Barwon LandCare Groups will be undertaken. Barwon Water will continue to provide information and consult with these stakeholders around aspects of specific interest such as, the impacts of groundwater extraction and impacts on flora and fauna.
- The Project Information Centre (including the free-call number, email address, website and local Project office) and the stakeholder database will be maintained to ensure effective two-way communication.
- Further editions of Community Information Bulletins will be developed and distributed and more Community Forums and Project Information Days held, to keep stakeholders and the general community up to date. Bulletins, Forums and Information Days will be scheduled to coincide with key Project milestones.
- Barwon Water will manage communication and consultation with landowners with oversight from Maloney Field Services and GHD. Communication and consultation with landowners will be in accordance with established protocols, utilising the MFS database. The importance of timely, open communication with landowners is acknowledged.
- Communication with Barwon Water customers via established mechanisms and consultation with through Barwon Waters' Environment Consultative and Customer Committees will continue.
- Barwon Water will maintain links with other key stakeholders as required, through the final planning and construction phases.

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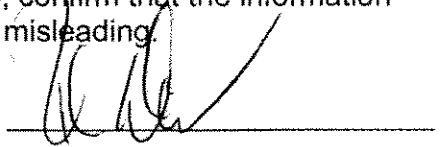
Figure 6 Land Tenure

Figure 7 Great Otway National Park / Anglesea Heath and the Eastern View Formation

Authorised person for proponent:

I, Paul Northey, Corporate Manager Strategy & Projects, confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature



Date 15 February 2008

Person who prepared this referral:

I, RUSSELL HAWKES.....(full name),

PRINCIPAL CONSULTANT (GHD).....(position), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature



Date

18/02/08