



East Appin 66kV Switching Station

**Environmental Assessment
Under Part 3A Environmental Planning & Assessment Act**

January 2006

Prepared by Olsen Environmental Consulting Pty Limited



Information Statement

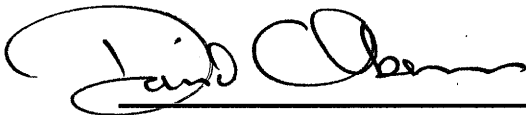
Olsen Environmental Consulting Pty Limited has prepared this Environmental Assessment based on information provided by BHPBilliton Illawarra Coal Pty Limited.

To enable a full environmental assessment to be undertaken, various reports have been prepared by specialist consultants in the areas of fauna, flora, acoustics, visual, archaeology and heritage. Olsen Environmental Consulting Pty Limited has relied on this information in preparing this Environmental Assessment.

David Olsen, Director of Olsen Environmental Consulting Pty Limited prepared this Environmental Assessment. David holds a Bachelors Degree in Agricultural Science with Honours.

CERTIFICATION

I certify that I have prepared this Environmental Assessment for the East Appin 66kV Switching Station, and to the best of my knowledge, it is true in all material particulars and does not, by its presentation or omission of information, materially mislead.



David Philip Olsen

3/2/06

Signature.

Name.

Date



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Executive Summary

This Executive Summary provides a summary of the Environmental Assessment of the East Appin 66kV Switching Station.

Section 1 introduces the main aspects of the Project. It will be located approximately 2.3km north of Appin and approximately 800m from the nearest residence.

The Project addresses existing and future power supply issues for West Cliff Colliery. Medium to long-term benefits will also flow to the local community by way of more efficient and reliable power distribution.

Section 2 describes the Project, its justification and a summary of the benefits compared to the potential impacts. The Section concludes with a general environmental risk analysis.

The Project will improve the distribution of 66kV power in the district and will also reduce the distance that 11kV power is transferred within West Cliff Mine. This will enable the West Cliff Mine to continue operations and will ensure the large amount of coal reserves in the West Cliff Mine can be developed and that the West Cliff Mine remains viable and operational.

The Project is a typical electricity supply distribution switching station commonly observed throughout the State. The Visual Impact Study Report prepared by Maurice Hayler's in Appendix VI includes a number of artist impressions and photographs of existing facilities that provide a clear understanding of what the switching station will look like.

Power will be transformed in the Switching Station from 66kV to 11kV. It will then be delivered underground to West Cliff Mine via purpose driven boreholes.

Access to the site will be via Appin Road and a temporary access track along the northern boundary of the property.

The property on which the Switching Station will be built is owned by the Department of Planning.

Up to 20 people will be on site during construction, which will take approximately 4 months. Once built, the facility should generally be self-operating and will require approximately one inspection per week for monitoring and maintenance purposes.

Section 3 investigates the alternatives to the proposed Project. The Project is the only alternative that rectifies the problems with the local power distribution system, saves energy by transforming the power from 66kV to 11kV closer to its point of use, and enables longer-term development of the coal resources in the West Cliff Mine.

Section 4 details the Environmental Planning Background for the Project. The Project is being assessed for approval by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979*.

The land is zoned Rural 1A under the Wollondilly Local Environmental Plan and the proposed Project is permissible on the land pursuant to this Plan. Part of the development extends onto land that is classed as regional open space under the Greater Metropolitan Regional Environmental Plan No. 2, George's River. Section 4 addresses the requirements of the LEP and the REP. There are no provisions in the above planning instruments that would prohibit the proposed Project.

Section 5 outlines the approvals required from other government agencies. The current West Cliff Mine Environmental Protection Licence (No 00568) will be modified to cover operational activities of the Switching Station. A mining lease for the site will be obtained under the *Mining Act 1992* from the Department of Primary Industries (Minerals).

Section 6 outlines the responses to the Project of various relevant groups, including government agencies and the community. The general response has been one of conditional support. Consultation with the community is ongoing.

Section 7 details the environmental impact assessment of the Project. The various issues addressed in Section 7 are summarised in the following paragraphs:

Dust. Any dust generated during construction and the operational phases of the project will be insignificant.

Surface Water Quality. Sediment controls built in accordance with the Landcom publication, "Soils and Construction" will be implemented to control surface water quality. A Site Water Management Plan will be developed and implemented.

Soils. Topsoils will be stored for use in rehabilitation. A Site Soil Management Plan will be developed and implemented for the site.

Acoustics. Noise levels emitted during the construction and operation of the Switching Station will meet all State Guidelines. Predicted noise levels could not be defined as offensive. During construction all equipment will be checked and maintained to ensure acceptable noise characteristics. Local residents will be advised prior to the carrying out of construction activities.

Fauna and Flora. There is a community of Shale Transition Forest occurring near the site. The impact of the proposed works on this community will not be significant. Potential habitat for *Grevillea parviflora* spp *parviflora* and *Persoonia hirsuta* occurs at the site. Assessments of significance were carried out for both of these species. These Assessments conclude that the proposed works will not have an effect on these species.

The proposed works will modify approximately 1.3 hectares of potential habitat for a number of listed fauna species. Given the mobility of these species and the extent of similar habitat in the immediate vicinity of the site, it is unlikely that the proposed works will have a significant impact on them.

Traffic. Due to the small number of employees and the limited construction time, significant traffic impacts are not expected.

Waste Management. A Site Waste Management Plan will be developed and implemented. All waste will be disposed of at appropriately licensed facilities off site. Recycling will be encouraged.

Electromagnetic Field Effects. These are not expected as the proposed works will be built to comply with the National Health and Medical Research Council (NHMRC) guidelines for the exposure of humans to Electric and Magnetic Fields.

Lighting. Lighting will be designed and constructed to minimise off-site spillage and to avoid lights shining directly towards residential areas.

Archaeology, History and Heritage. No Aboriginal sites or heritage items were recorded during a survey of the site. There are no known Aboriginal or heritage aspects associated with the site.

Visual Effects. Significant visual impacts are not expected. Existing trees effectively screen the Switching Station from Appin Road. Additionally, the Switching Station is located approximately 900m from Appin Road and is not located on a prominent position of the local landscape.

Section 8 details the Environmental Management System that BHPBilliton will implement to ensure appropriate environmental management of the Project.

Section 9 is a draft Statement of Commitments, which indicates the measures BHPBilliton will undertake to minimise impacts on the environment if the Project is approved.

The Appendices contain the Director General's Requirements for this Environmental Assessment, the environmental issues identified in the Preliminary Assessment of the Project, and all the supporting specialist consultant reports.

This Environmental Assessment does not identify any environmental issues that would preclude conditional approval of the Project.

1. Introduction

As part of the ongoing operations of the West Cliff Coal Mine, BHPBilliton plans to install the new East Appin 66kV Switching Station approximately 2.3km north of the Appin Colliery.

The Switching Station will enable a 25MVA supply of power to be delivered underground at the West Cliff Coal Mine at 11kV.

The Project will have immediate benefits for the West Cliff Coal Mine and will also provide long-term benefits to the community through more efficient distribution of power via the State electricity grid in the Appin area.

The general location of the proposed Switching Station is shown on Figure 1. Details of the site layout are shown in Figure 2.

BHPBilliton is seeking approval to construct and operate the East Appin 66kV Switching Station and associated service boreholes. The proposed works are required to ensure the ongoing operation of the West Cliff Coal Mine.

The construction and operation of the East Appin 66kV Switching Station and associated service boreholes, is categorised as development for the purpose of mining related works for the purposes of Clause 6 and Item 5 of Schedule 1 of the *State Environmental Planning Policy (Major Projects) 2005*. Consequently, it is a “project” for the purposes of Part 3A of the *Environmental Planning and Assessment Act 1979* and requires approval from the Minister for Planning under Part 3A.

In December 2005, BHPBilliton lodged a Project Application with the Department of Planning. A Preliminary Assessment prepared in accordance with existing Department of Planning Guidelines and requirements supported the Project Application.

The Department of Planning reviewed the Project Application and Preliminary Assessment and provided the Director General’s environmental assessment requirements (DGRs) for the Project.

This Environmental Assessment of the Project must be prepared in accordance with the DGRs.

The DGRs nominate the requirements for the Environmental Assessment, key issues to be addressed, the level of assessment required in relation to these issues and any other requirements the Director General determines as being relevant.

The DGRs were prepared by the Department of Planning having regard to any relevant existing guidelines, in addition to the information included in the Project Application and Preliminary Assessment.

The DGRs are included in Appendix II of this Environmental Assessment.

2. Project Description, Justification and Benefits Summary

2.1 Description and Justification

The East Appin 66kV Switching Station Project is located approximately 2.3km north of Appin Colliery and is approximately 800m distant from the nearest residences.

The objective of the Project is to increase the existing underground supply at West Cliff from the current 10MVA capacity to a 25 MVA supply of power to be delivered at 11kV.

Coal reserves in West Cliff Mine Area 5 will support many years of future mining. The currently approved Mine Operations Plan proposes the mining of Longwall Blocks 31 to 40 between June 2006 and June 2017. The existing electricity power supply system into West Cliff Area 5 has the potential to restrict the extent and rate of mining. This will compromise the economic viability and ongoing operation of the

West Cliff Mine. The current Project best meets the requirements for additional power and minimises any impacts to the environment.

The main issues requiring resolution are:

- The 11kV underground feeder is currently operating at capacity;
- The long distances over which power is transferred underground at 11kV result in low voltage at the point of use and problems starting large equipment;
- The surface 11kV distribution system is operating at 90% design rating; and
- The surface 66kV network capacity is at 85% design rating.

Consequently, an upgrade of the West Cliff Mine's 11kV capacity and 11kV distribution network is required to support current operations and allow extraction of the current coal reserves in West Cliff Mine Area 5. There is also a need to upgrade the 66kV supply system.

The Project is a typical electricity supply distribution switching station. The switching station will consist of two 66/11kV transformers, two demountable style single level control buildings (approximately 10m x 5m), security fencing, lightning protection, access road connection to Appin Road, four service boreholes connecting the surface facility with underground mine workings at a depth of approximately 480m and switchyard lighting.

There are a number of other facilities that will service the proposed East Appin 66kV Switching Station, including a power transmission line, telephone line and a potable water service line. These are not part of the Project being applied for. The approvals required for these facilities will be applied for in the future.

The general construction method for the Switching Station will consist of offsite fabrication of components, which will then be delivered to the site for assembly. There will not be any on-site worker accommodation. Temporary buildings for administration, meals and toilets/bathhouse will be provided and removed at the completion of construction.

Once constructed, the Switching Station will be generally self-operating. Access will be required approximately once per week to enable inspections for monitoring, maintenance and repairs.

Construction is planned to commence in May 2006, continue over a 4-month period, and be completed immediately prior to September 2006.

During construction, up to 20 employees will be on site. The typical construction workforce will range from 10 to 20. Earthworks, establishing foundations, various civil works and borehole drilling operations will be in progress for a period of approximately 8 weeks.

All components will be fabricated off-site and will be delivered to the site for installation immediately the earthworks and associated activities outlined above are completed. Installation is expected to take 4 weeks and involve an on-site workforce of between 10 and 15 employees.

Once the components are in place installation of cabling and termination works, which involves indoor and exterior electrical installations will be completed. This is scheduled to occur over a period of 4 weeks and will require 20 employees on site.

The installation will require commissioning and testing prior to being brought on-line. This will require a workforce of 20 people for a period of 4 weeks.

Construction hours will be 7am to 6pm Monday to Friday and 7am to 1pm Saturdays.

Although there will not be any construction undertaken on Sundays or public holidays, there may be indoor wiring and termination activities, as well as commissioning tests, undertaken on these days to coincide with Integral and West Cliff Mine requirements.

The Switching Station will operate for at least 15 years following construction and commissioning.

2.2 Benefits Summary

The likely environmental impacts from the Project will not be significant. The commitments to environmental management for the Project given by BHPBilliton will ensure that any impacts from the Project are minimised and managed appropriately.

Benefits will accrue to BHPBilliton, their workforce, associated suppliers, contractors and the community more generally through the ongoing operation of the West Cliff Mine.

Benefits will accrue to the State through the development and extraction of a valuable coal resource and the related taxation, royalty and other fees that flow from that resource utilisation.

The local community and Integral Energy will benefit from the provision of a more reliable and diverse electrical supply system in the Appin area.

Given the level of benefit compared to the potential environmental impact, there does not appear to be any reason for the East Appin 66kV Switching Station Project to not receive approval and proceed.

2.3 General Environmental Risk Analysis

The Preliminary Assessment that was submitted to the Department of Planning summarised the most likely environmental issues resulting from implementation of the Project. It also described the level of assessment required to determine the extent of the issues and to develop amelioration measures.

Issues and the appropriate level of assessment were summarised in Table 4 of the Preliminary Assessment submitted to the Department of Planning. This Table is included in Appendix I of this Environmental Assessment.

The environmental management systems, the actions outlined in the Statement of Commitments and the personnel of both Integral and BHPBilliton demonstrate an ability to undertake the Project with proper consideration and management of any potential environmental impacts from the Project.

With implementation of the environmental management systems and the actions outlined in the Statement of Commitments the East Appin 66kV Switching Station can be constructed and operated with no significant environmental risk.

3. Project Alternatives and Project Justification

Consideration of the West Cliff Mine strategic power supply requirements led to the development of a range of alternative options for consideration and assessment.

The various options included alternatives and possibilities for 66kV and 11kV installations, substation locations, 66kV aerial/cable routes and the 11kV cable route. The alternatives and possibilities can be summarised in the following five options.

- Do nothing,
- Expand Existing Substation,
- New Substation at Brennans Creek Dam and extend existing 66kV line,
- New substation above 503 and 504 panels and extend existing 66kV line, and,
- New substation and install new 66kV line.

The following sections briefly describe these alternative options and the reasons they were not preferred.

3.1 Option 1. Do Nothing

An upgrade of the West Cliff Mine's 11kV capacity and 11kV distribution network is required to support current operations and allow extraction of the current coal reserves in West Cliff Mine Area 5.

Without installing new equipment the only capacity for improvement in the system is through upgrading the current feeder cables, which are currently at-capacity. This Option addresses short-term power supply issues only and would not enable full mining development in Area 5. This Option does not overcome the significant loss of power which comes from the large distances it needs to be transferred over following conversation to 11kV.

Consequently, it is not an acceptable option.

3.2 Option 2. Expand Existing Substation

This Option would involve the expansion of the existing West Cliff surface substation to accommodate additional 66/11kV transformer capacity. The feeder cables from the upgraded substation to Area 5 would also require improvement. Due to the distance of power transfer, the supply cables between the substation and Area 5 would be very large and extremely difficult to handle and install. This Option does not capture any power conservation benefits that arise from options which have the power transformed from 66kV to 11kV closer to the point of consumption.

It is not an acceptable Option.

3.3 Option 3. New Substation at Brennans Creek Dam and Extend Existing 66kV Line

This Option would involve the installation of a new surface substation adjacent to Brennans Creek Dam in order to accommodate additional 66/11kV transformer capacity. As with Option 2, the 11kV feeder cables to Area 5 would be of a size that restricts mobility and creates difficult installation issues. This Option does not capture any power conservation benefits that arise from options which have the power transformed from 66kV to 11kV closer to the point of consumption. It also does not address any 66kV distribution matters.

Given the above it is not an acceptable Option.

3.4 Option 4. New Substation Above 503 and 504 Panels and Extend Existing 66kV Line

This Option involves the installation of a new surface substation above Longwall Panels 503 and 504 in Area 5 in order to accommodate additional 66/11kV transformer capacity. As this Option does not resolve any 66kV network issues, it is not an acceptable Option.

3.5 Option 5 New Substation and Install New 66kV Line

This Option involves the location, at approximately 2.3km north of Appin, of a Switching Station and boreholes. Power will be transformed in the Switching Station from 66kV to 11kV and the delivered underground to West Cliff Mine via purpose driven boreholes.

This is the only feasible alternative that:

- ensures the viability of current operations and allows extraction of the current coal reserves in West Cliff Mine Area 5; and
- provides energy consumption efficiencies (as the power is transformed from 66kV to 11kV closer to the point of consumption) and overcomes the capacity problems in the West Cliff Mine Power Supply System.

Given the above this is the preferred Option and is the one fully described in Section 2 of this application.

4. Environmental Planning Background

The site is located within the Wollondilly Shire Local Government Area and is zoned Rural 1A under the *Wollondilly Local Environmental Plan 1991*. The proposed development is characterised as development for the purpose of mining and is permissible in the Rural A1 Zone with development consent.

The land is located within a Mine Subsidence District within the meaning of Section 15 of the *Mine Subsidence Compensation Act 1969* and BHPBilliton will consult with the Mine Subsidence Compensation Board in relation to it. Longwall extraction has occurred in the area beneath the proposed works.

According to Council records, part of the Project area is listed as bush fire prone land.

The land is subject to the provisions of Greater Metropolitan Regional Environmental Plan No 2, George's River Catchment. The vegetated area affected by the Project is classed as regional open space in accordance with the REP. The Project is not inconsistent with this instrument.

4.1 Greater Metropolitan Regional Environmental Plan No 2, George's River Catchment

This REP aims to:

- Maintain and improve the water quality and river flows of the Georges River and its tributaries.
- Protect and enhance the environmental quality of the Catchment for the benefit of all users, and,
- Ensure consistency in the delivery of the principles of ecologically sustainable development within the Catchment and promote integrated catchment policies.

The REP has a number of general and specific planning principles that guide development assessment in the Catchment.

In relation to the general planning principles:

- The management and operation of the Project is consistent with the aims, objectives and planning principles of the REP;
- There is not likely to be any effect on adjacent or downstream Local Government Areas from the Project;
- Cumulative impacts from the Project on the Georges River is likely to be minimal or not measurable;

- All relevant plans, strategies and guidelines have been followed in the preparation of this Environmental Assessment; and
- This is the only feasible alternative that provides energy consumption efficiencies and overcomes the capacity problems in the West Cliff Mine Power Supply System.

In relation to specific planning principles:

- There are no acid sulfate soils present on the site;
- The bank of the Georges River will not be affected by the Project;
- The site will not be subject to, or affect flooding of the Georges River;
- Industrial discharges are not part of this Project;
- Land degradation issues will be addressed during construction by implementation of a Soil Management Plan and a Water Management Plan;
- On-site sewage management will be affected by collection and off-site disposal at an appropriately licensed facility;
- No river-related uses are proposed;
- Sewer overflows will not occur with this Project;
- Stormwater runoff will be managed in accordance with guidelines detailed in the Landcom Publication, “Soils and Construction” Volume 1, 4th Edition, dated March 2004;
- The Project does not include any urban development;
- The Project is located at least 100m from the Georges River. The land between the Project and the River supports relatively undisturbed native vegetation which provides an adequate vegetative buffer area in accord with the REP; and
- The Project will not adversely affect water quality, river flows or any wetlands.

The REP includes a section that contains requirements for consent and consultation when assessing certain developments and activities within the catchment. This section defines consultation requirements and planning controls for specific types of development described in the REP that are likely to significantly affect the water quality or river flows of the Georges River or its tributaries and the environment within the Catchment.

This section does not apply to this Project because this Project will not have a significant affect. Additionally, the REP does not specify any requirement for consultation.

The relevant planning controls are those set out in the *Wollondilly Local Environmental Plan 1991*. The Project is consistent with those planning controls.

4.2 Development Control Plans

Wollondilly Shire Council Officers advised that there is a number of Development Control Plans that apply to land zoned Rural A1 that may be relevant to this Project. These are as follows:

- DCP No 7-Off street Parking,
- DCP No 21-Earth Dams,
- DCP No 36-Development in Rural Zoned Areas,
- DCP-Design Code, and,
- DCP-Wollondilly Agricultural Lands.

DCP No 7-Off street Parking. This DCP defines the provision of parking spaces for developments in rural areas. There are no provisions for items of infrastructure, and therefore it is not applicable to this development.

DCP No 21-Earth Dams. This DCP relates to the design and construction of water supply dams in rural areas. The proposed development does not include any such dams. It will include a small sedimentation pond designed in accordance with the Landcom publication, “Soils and Construction” Volume 1, Fourth Edition, dated March 2.

DCP No 36-Development in Rural Zoned Areas. This DCP relates more to houses, driveways and agricultural development and is not relevant to this Project.

DCP-Design Code. This DCP addresses issues related to stormwater control from roads especially where the Council is likely to assume ongoing maintenance. It is not relevant to this Project.

DCP-Wollondilly Agricultural Lands. This DCP is similar to DCP 36 and it addresses issues related to agricultural developments. It is not relevant to this Project.

5. Other Approvals Required

West Cliff Mine already holds a Environmental Protection Licence (No. 00568) from the Department of Environment and Conservation (DEC) under the *Protection of the Environment Operations Act 1997*. This Department will be notified of the new Switching Station and the existing licence may be modified to accommodate any additional requirements that DEC may have.

A mining lease under the *Mining Act 1992* will be acquired from the Department of Primary Industries (Minerals).

Due to the low predicted traffic numbers during construction and operation of the Project no approvals are required from the Roads and Traffic Authority. However, the Roads and Traffic Authority has been consulted in relation to the Project.

The Department of Planning owns the land for the project and appropriate access arrangements with them will be finalised shortly.

6. The View of Other Agencies, Local Council and the Community

6.1 Wollondilly Shire Council

A meeting was held with a Planner and an Engineering Department representative from Wollondilly Shire Council to provide them with information the Project. The Planner agreed that the Project required approval under Part 3A of the *Environmental Planning and Assessment Act 1979*.

Discussions were held with the Planner to clarify the applicability of the Planning Instruments discussed in Section 3.

A presentation outlining the Project was also made to a Local Ward Councillor.

6.2 Integral Energy

Lengthy discussions have been undertaken with Integral Energy. They have assisted with the planning and environmental assessment of the Project. They have advised that the required power is available from the supply system.

6.3 Local Community

Local landholders have been advised of the Project. BHPBilliton operates a very extensive community consultation programme for its mining activities in this area. BHPBilliton supports the operation of the Appin Area Community Working Group (AACWG) and participate in the meetings of this group.

BHPBilliton also operates an office in the Appin Business and Shopping Precinct. This office provides information to the community and operates as a meeting room for the community to discuss developments at Appin and West Cliff Mines. A notice of this Project has been placed at this office to inform members of the local community about it.

BHPBilliton has a 24 hour contact telephone line for the community to be able to contact the Mines as required.

These communication mechanisms will ensure timely community input into the approval, construction and monitoring of the development.

6.4 Department of Planning

The Department of Planning are the owners of the land on which the East Appin 66Kv Switching Station will be constructed.

Discussions were held with Officers from the Department of Planning in Parramatta with respect to site access, leasing and potential acquisition. Approval to lodge the Environmental Assessment and to access the site for investigation and study purposes has been received from the Department.

Discussions have also been held with Departmental Officers from the Major Developments Assessment Branch to clarify process and other issues relating to the new Part 3A approval process.

6.5 Roads and Traffic Authority

A meeting has been held with the Roads and Traffic Authority in Wollongong. Numerous discussions have taken place to clarify issues with the RTA. Due to the low predicted traffic numbers during construction and operation of the Project no approvals are required from the Roads and Traffic Authority. However, the Project the Roads and Traffic Authority has been consulted in relation to the Project and BHPB will continue to liaise with them in relation to it.

6.6 Mine Subsidence Board

The Project will be undertaken within a Mines Subsidence District. The area beneath the Project has been fully mined and no further subsidence is expected. The Mine Subsidence Board has been advised of the Project and will be consulted in relation to it.

7. Environmental Impact Assessment

The following section addresses the environmental issues predicted in the Preliminary Assessment and those issues required to be assessed by the DGRs.

7.1 Air Quality and Dust

Dust will be a potential issue only during the construction of the East Appin 66kV Switching Station. During construction, a water cart will be used on site to reduce the generation of dust. This is a standard method of dust control during construction activities.

The nearest residence is approximately 800m distant from the site and it is unlikely they would be affected by any dust falling on the residence. Dust will be controlled to avoid unnecessary visual impact at the residence and to prevent dust impacts on vegetation close to the site.

7.2 Surface Water Quality

During construction, surface water will be controlled by a series of surface drains leading to a sedimentation basin prior to final discharge from the site.

The surface drains and sedimentation basin will be constructed in accordance with the Landcom publication, “Soils and Construction” Volume 1, Fourth Edition, dated March 2004.

A sedimentation fence will be constructed immediately down slope of the area disturbed by construction. Similar fences will be constructed down slope of any stockpiled soil materials.

The sedimentation fences will be installed in accordance with requirements as described in “Soils and Construction”, hip pocket handbook, 1st Edition, dated March 2004.

A surface drain will be constructed immediately up stream of the site to divert runoff water away from the site. This will stop water running onto the site and minimise the amount of water that has to be retained in the sedimentation basin.

The construction contractor will prepare a Site Environmental Management Plan that will include a Site Water Management Plan. The Site Water Management Plan will contain the detailed design features discussed in this section.

7.3 Soil Management

Topsoil from the area to be disturbed will be stripped and stockpiled at the commencement of construction. This topsoil will be used to resurface disturbed areas prior to revegetation.

The topsoil will be stockpiled in an area above the sedimentation fence located down slope of the site. The topsoil stockpile will have a downstream sedimentation fence unless it is located near the general site sedimentation fence.

Subsoil material will be moved around the site to provide for design cut and fill volumes. The topsoil will be returned to any cut and fill batters requiring revegetation.

The site will be seeded with pasture grass species consistent with those present in the existing improved pastures surrounding the site.

The construction contractor will prepare a Site Environmental Management Plan that will include a Site Soil Management Plan.

7.4 Acoustics

BHPBilliton commissioned Day Design Pty Ltd, Consulting Acoustical Engineers, to undertake an acoustic assessment of the Project.

Day Design has undertaken a number of similar assessments for Integral Energy and are experienced in this field. Day Design prepared two reports of their assessment. Copies of their Reports, titled “Environmental Noise Impact. East Appin 66kV Switching Station” and “Construction Noise Impact. East Appin Switching Station”, both dated January 2006. These Reports are included in Appendix IIIa and IIIb respectively of this Environmental Assessment.

7.4.1 Construction

The Day Design Report in Appendix IIIb details the procedures and findings of their assessment of the predicted noise impact resulting from the construction of the East Appin 66kV Switching Station.

Day Design conclude that their measurements and computations show that the level of noise emitted by the proposed construction works complies with the construction noise criteria at the nearest and most affected receptor locations.

Construction will generate noise both at the site itself, and from vehicles accessing the site from Appin Road. Both areas of noise impact were assessed individually and the results are included in Tables 7.1 and 7.2.

Table 7.1. Calculated $L_{eq,(15min)}$ Noise Levels at Receptor Locations due to Construction Activities on Site

Receptor Location	Acceptable Level	Calculated Level	Compliance
180 Appin Road, Appin	52dBA	43dBA	Yes
196 Appin Road, Appin	52dBA	43dBA	Yes

The Receptor Locations are accurately defined on Figure 1 of the Day Design Report (Appendix IIIb).

At a distance of approximately 800m, the calculated sound pressure level at both Receptor Locations due to the Switching Station construction activities is well below the construction noise criterion of 52dBA during construction hours and is therefore acceptable.

Table 7.2 Calculated $L_{eq,(15min)}$ Noise Levels at Receptor Locations due to Access Traffic.

Receptor Location	Acceptable Level	Calculated Level	Compliance
180 Appin Road, Appin	52dBA	38dBA	Yes
196 Appin Road, Appin	52dBA	52dBA	Yes

The Receptor Locations are accurately defined on Figure 1 of the Day Design Report (Appendix IIIb).

At a distance of approximately 100m to 180 Appin Road and 23m to 196 Appin Road, the calculated sound pressure level at the two receptor locations due to traffic along the access road complies with the construction noise criteria of 52dBA during construction hours and is also acceptable.

Day Design concluded that the level of noise predicted to be emitted by the proposed construction works complies with the construction noise criteria at the nearest and most affected receptor locations.

Although noise control measures are not required for compliance with the construction noise criteria, Day Design recommended a number of basic administrative noise controls to further reduce noise impact. These are as follows:

- Equipment should be well maintained to avoid unnecessary squeaks, rattles and exhaust noise. If the noise level of an item of equipment is suspected of being out of specification as defined in Table 6.1 of the Day Design Report (Appendix IIIb), the noise level of the equipment should be measured and the necessary maintenance action taken, and,
- Nearby residents should be informed of the construction works via letter drops and the contact details of the site manager should be provided to residents. In the event of a noise complaint, the site manager should immediately investigate and respond to the complaint.

These administrative controls will be implemented.

Day Design concluded their Report with the opinion that, during construction, the sound emitted from this development will not cause offensive noise as defined by the *Protection of the Environment Operations Act 1997*.

7.4.2 Operations

The Day Design Report in Appendix IIIa details the procedures and findings of their assessment of the predicted noise impact resulting from the operation of the East Appin 66kV Switching Station.

Day Design concluded that the predicted level of noise from the operation of the proposed East Appin 66kV Switching Station is well below the Guidelines in the Environment Protection Authority's Industrial Noise Policy and is considered acceptable at all existing nearby residences.

The calculated L_{eq} noise levels at the two nearest receptor locations is shown in Table 7.3

Table 7.3. Calculated L_{eq} Noise Levels at Receptor Locations

Receptor Location	Acceptable Level	Calculated Level	Tonal	Compliance
180 Appin Road	36dBA	<20dBA	No	Yes
196 Appin Road	36dBA	<20dBA	No	Yes

The Receptor Locations are accurately defined on Figure 1 of the Day Design Report (Appendix IIIa).

At a distance of approximately 800m, the calculated sound pressure level at the two nearest receptor locations in Appin will be less than 20dBA (and inaudible), which is less than the annoyance criteria of 36dBA night criterion and therefore acceptable.

Day Design concluded that the proposed East Appin 66kV Switching Station will not require any specific noise control measures to comply with the noise guidelines recommended in the Industrial Noise Policy.

Day Design concludes their Report with the opinion that, during operations, sound emitted from the proposed development will not cause offensive noise as defined by the *Protection of the Environment Operations Act 1997*.

7.5 Fauna and Flora

BHPBilliton commissioned Biosis Research Pty Ltd to undertake an assessment of the Project's impact on fauna and flora.

A copy of their Report titled "Flora and Fauna Assessment: East Appin 66kV Switching Station" is included in Appendix IV in this Environmental Assessment.

The Biosis Report details the process and methodology implemented to undertake the assessment. The aim of the Report is to describe a terrestrial flora and fauna study of the area around the Switching Station and to determine the impact of the Project on any matter of conservation significance.

This objective was achieved by the following:

- Conducting a literature review and database search for the study area,
- Providing a brief assessment of the habitat values of the study area,
- Undertaking targeted field surveys for threatened terrestrial species, populations (and/or their habitats) and ecological communities listed under the schedules of the *Threatened Species Conservation Act 1995* (TSC), and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) that are known or likely to occur within the study area,
- Undertake Section 5A Assessments of Significance for threatened species, populations and ecological communities listed on the TSC Act and/or Assessments of Significance for threatened and migratory species listed on the EPBC Act that are either directly or indirectly impacted by the Project, and,
- Providing recommendations to minimise the environmental impacts of the proposed development.

7.5.1 Flora

The study area has been previously disturbed by agricultural practices and is located in cleared paddocks with a minor area of native vegetation to be cleared to install boreholes and associated services.

Three vegetation communities were identified in the area:

- Western Sandstone Gully Forest,
- Shale Sandstone Transition Forest, and
- Cleared Paddocks.

The location and distribution of these communities is shown on Figure 3 of the Biosis Report (Appendix IV).

Both the Western Sandstone Gully Forest and the Shale Sandstone Transition Forest were considered to be in good condition, with limited weed invasion, high native species diversity and all structural layers intact. The Cleared Paddock habitat was considered to be in poor condition, with a high level of weed invasion, low native species diversity and all structural layers either modified or missing.

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community under both the TSC and EPBC Acts. The proposed works will not involve the

removal of any areas of Shale Sandstone Transition Forest, with the exception of some possible branch removal and clearing of some trees associated with the community occurring as scattered trees in Cleared Paddocks.

Consequently, Biosis concludes that the impact of the proposed works on this ecological community is considered to be negligible and, as such, Assessments of Significance were not required for this community.

No threatened plant species were recorded in the study area. The vegetation community in the study area is potential habitat for two threatened plant species, *Grevillea parviflora* spp. *parviflora* and *Persoonia hirsuta*.

Grevillea parviflora spp. *parviflora* is listed as Vulnerable on both the TSC and EPBC Acts, while *Persoonia hirsuta* is listed as Endangered in both Acts.

Assessments of Significance under the TSC Act and the EPBC Act were carried out for these two species. These Assessments concluded that the proposed works would not have a significant impact on these species.

7.5.2 Fauna

Fauna habitat within the study area broadly corresponds to the plant communities and consists of Cleared Paddocks and Woodland. Twenty animal species were recorded utilising these habitats during the study. Seven of these were introduced species.

No threatened fauna were recorded during the survey. However, the study area contains potential habitat for ten animal species listed on the TSC and EPBC Acts:

- Bush-stone Curlew,
- Gang-gang Cockatoo,
- Glossy Black Cockatoo,
- Brown Treecreeper,
- Swift Parrot,
- Turquoise Parrot,
- Regent Honeyeater,
- Eastern False Pipistrelle,
- Koala, and,
- Broad Headed Snake.

The proposed works are likely to modify 1.3ha of the potential habitat for these animal species within the study area. Biosis concludes that, given the mobility of these species and the extent of similar habitat in the immediate vicinity of the study area, it is likely that the proposed works would have an insignificant impact on these species.

Biosis also concluded that the nature of the proposed work is such that it is considered highly unlikely that death or injury, or loss of limiting breeding or foraging resources for any threatened animal species will occur. Consequently, for these species, Assessments of Significance under the TSC or EPBC Acts were not required.

Biosis were also of the opinion that neither a Species Impact Statement under the TSC Act, nor a Referral for Matters of National Significance under the EPBC Act was required.

Biosis reviewed the likely impact on Koala in accordance with State Environmental Planning Policy Number 44. Because of the low occurrence of potential Koala habitat and no direct or indirect evidence of the species in the study area, Biosis concluded that a SEPP 44 Assessment was not required.

7.5.3 Recommendations

Biosis concluded that the proposed works are unlikely to have a significant impact on threatened species, endangered ecological communities or populations. However, they recommend that the following points are taken into consideration to minimise any disturbances on the ecological values of the study area:

- Where possible, trees with hollows should be retained,
- Appropriate sediment/erosion and drainage control devices should be utilised during and after excavation works in order to prevent sediment laden runoff,
- Care should be taken during construction to minimise disturbance to native vegetation and to avoid spreading exotic species propagules into the adjoining vegetation,
- Any landscape or rehabilitation works should use local native species, and,
- A suitably qualified and experienced person should undertake all weed control and rehabilitation works.

7.6 Traffic Impacts

Access to the site will be via a constructed earthen track that will provide an intersection onto the Appin Campbelltown Road.

Construction workforce numbers are predicted to peak at 20 for an eight week period. Construction is expected to take four months. It is expected that a maximum of four vehicles will be required to provide transport for this workforce.

The construction equipment will be floated to site on low-loader vehicles. The construction equipment will remain on site until the completion of construction. It is expected that eight low loader movements will be required prior to commencement and at the conclusion of construction. During the construction period approximately 12 vehicles per day will access the site in relation to supervision, maintenance and monitoring activities. At these predicted levels, access from the site onto the Appin Road is not expected to create a significant impact.

Operational access requirements will generally be limited to a once weekly inspection for maintenance and monitoring purposes.

7.7 Waste Management

During construction, waste will be generated on site from the following sources:

- Packaging from materials and supplies,
- Wastewater from the temporary office, toilet and bathhouse facilities,
- General office waste, and,
- Vehicle servicing wastes.

The construction contractor will prepare a Site Environmental Management Plan that will include a Site Waste Management Plan.

Packaging wastes will be separated into metal, wood and other recyclable streams. These separated waste materials will be recycled in an approved manner.

Non-recyclable materials will be collected separately and will be disposed off-site in an approved waste facility.

Wastewater from the temporary office, toilet and bathhouse will be collected on-site prior to transport off-site for disposal at an appropriately authorised disposal facility.

General office waste will be collected and disposed off-site at a licensed waste facility.

Vehicle servicing wastes will consist of oil and greases together with assorted hydrocarbon containers. The oils, greases and containers will be collected for recycling.

7.8 Electromagnetic Field Effects

The National Health and Medical Research Council (NHMRC) has adopted guidelines for the exposure of humans to Electric and Magnetic Fields.

The proposed works will be within the limits set by the guidelines and electromagnetic field effects are not expected as a result of the proposed works.

Integral Energy has an ongoing commitment to a policy of “Prudent Avoidance” endorsed by the Electricity Association of Australia with regards to the location of assets that generate electromagnetic fields. Prudent avoidance is defined as taking reasonable steps to minimise exposure to electric and magnetic fields where this can be done without undue inconvenience or undue exposure.

7.9 Switch Station Lighting

In order to provide site security and a safe working environment, the Switching Station will require exterior lighting during operations.

The lighting will be designed and constructed to minimise light spillage from the site and to avoid lights shining directly towards residential areas.

The nearest residence is approximately 800m distant and is unlikely to be affected by lighting spillage. Steps will still be taken to minimise the effects of site lighting.

7.10 Archaeology, History and Heritage

BHPBilliton commissioned Biosis Research Pty Ltd to undertake an assessment of the Project's impact on Aboriginal archaeological aspects.

A copy of their report is included in Appendix V in this Environmental Assessment Report. The Report details the Study methodology and process as well as reporting findings and recommendations.

The Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Title Claimants are the relevant Aboriginal community organisations for the area. Representatives from both groups participated in the field survey.

There have been a number of previous archaeological surveys undertaken in the Appin area. These surveys provided extensive background information for the current study.

A total of 13 aboriginal archaeological sites have previously been identified in the vicinity of the study area, however, none have been recorded within the study area.

In addition to reviewing previous survey results, an archaeological survey of the site was undertaken during January 2006. The majority of the site has been disturbed from clearing and agricultural activity.

No Aboriginal archaeological sites were located within the study area during the survey. There was no evidence of Aboriginal archaeological remains, such as stone artefacts. Biosis also assessed that there was no potential Aboriginal Archaeological sites or deposits present on the site.

Biosis also surveyed nearby rock outcrops, which were closer to the George's River, but outside of the specific study site. There was no evidence of rock shelters or overhangs in this area.

Biosis recommended that in the event of any unanticipated cultural heritage material being uncovered during any excavation, all excavation works should cease. The Department of Environment and Conservation, as well as the Consulting Archaeologist, should then be notified. This recommendation will be implemented.

The *Wollondilly Local Environmental Plan 1991* does not identify any heritage items within the study area, nor are there any apparent heritage items affected by the Project.

7.11 Visual Impact

BHPBilliton commissioned Maurice Hayler and Associates, Architects, to undertake an assessment of the Project's visual impact.

A copy of their Report is included in Appendix VI in this Environmental Assessment. It is titled "Visual Impact Study. Proposed East Appin 66kV Switching Station. Appin NSW" and is dated January 2006.

Hayler concludes that given the existing circumstances and by adopting his Report's recommendations, it is not likely that the proposed Switching Station would be noticeable or offensive to a member of the public when viewed from Appin Road.

The Report includes a number of diagrams that assist in appreciating the visual effects of the Project. The diagrams include artist impressions (Hayler Report Appendices 1, 2 and 6), photographs of typical high voltage electrical switch gear (Appendix 3), photographs of typical switching station fencing materials (Appendix 4), photographs of the site and surrounds (Appendix 5), photographs and plans of the existing vegetation screening (Appendix 7), and photographs of typical concrete power poles (Appendix 8).

The Hayler Report notes that the East Appin 66kV Switching Station is well located at a distance of approximately 900m from Appin Road so that its visibility from Appin Road would be minimal.

Existing trees effectively screen the view of the Switching Station from Appin Road.

Hayler recommends a number of measures to reduce the visual impact and to blend the Switching Station into the background. These are listed below and will be implemented:

- The perimeter fence should be paint finished in charcoal or dark grey matt finish,
- Roofs of the buildings should be equal to Colorbond Windspray (grey) or Wilderness (grey green), and,
- Metal wall cladding should also be equal to Colorbond Windspray (grey) or Wilderness (grey green).

8. Project Environmental Management

BHPBilliton will manage the East Appin 66kV Switching Station Project in accordance with the Integral Energy Environmental Management System (EMS). The Integral EMS is described in a series of documents. The most applicable to the East Appin 66kV Switching Station are as follows:

- Integral Document No. EMS 0001, "Environmental Due Diligence and Environmental Management Plans".

- Integral Document No. EMS 0002, “Pollution Control”.
- Integral Document No. EMS 0007, “Waste Management”.
- Integral Document No. EMS 0008, “Environment Incidence Response”.
- Integral Document No. EMS 0011, “Environmental Guidelines for Level 2 Accredited Service Providers”.

Integral Document No EMS 0001 calls for the development and implementation of an Environmental Management Plan for all Integral activities. The East Appin 66kV Switching Station will have an EMP developed in accordance with the Integrals’ requirements as described in their documents.

The EMP will address such issues as:

- Utilities and Services,
- Roads, Traffic and Access,
- Visual Impact,
- Water Quality, Soil Erosion and Sedimentation,
- Noise,
- Flora and Fauna,
- Safety, Hazards and Traffic Management,
- Heritage and Archaeology,
- Waste Handling and Disposal,
- Community Consultation, and,
- Air Quality and Dust Suppression

The EMP will be very similar to those used at BHPBilliton Illawarra Coal operations and will be readily adopted and managed by current arrangements.

BHPBilliton also has certification in accordance with ISO 14001.

The successful works contractor will prepare a safe working method statement, which will include details of the environmental controls for the worksite. The following details will be included as a minimum:

- All staff will be briefed on the environmental controls prior to work commencing,

- Spoil control and the erection of silt and erosion fences,
- Noise and local environmental constraints,
- All waste will be collected and deposited in the designated areas,
- Spill kits will be maintained on site at all times,
- Plant will receive an inspection prior to commencing work on site in order to determine safety and fit for purpose status, and,
- Plant will also be inspected daily.

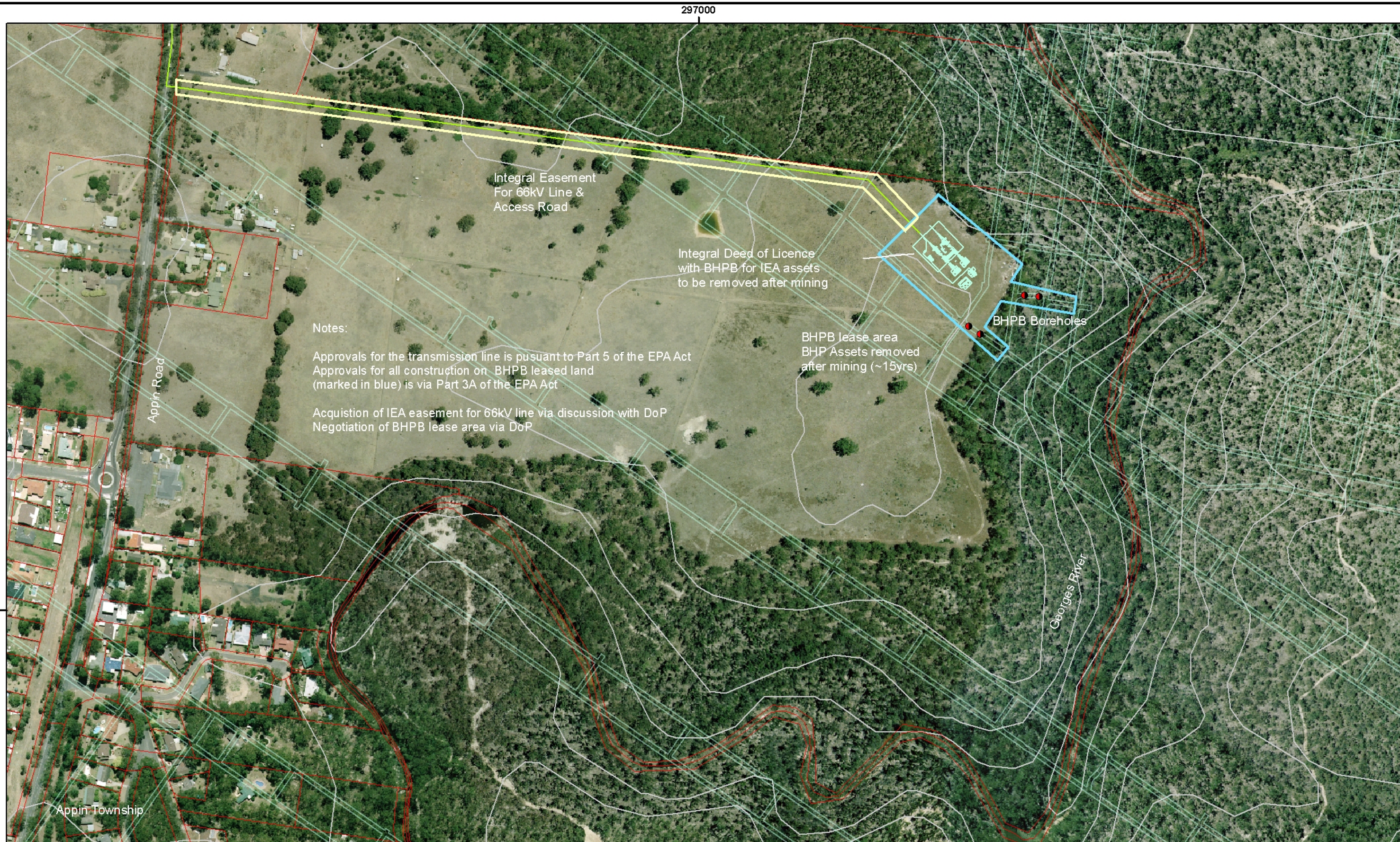
9. Statement of Commitments

This section lists all the commitments in this Environmental Assessment that BHPBilliton has made and will undertake to minimise impacts on the environment if the Project is approved.

- BHPBilliton will continue to operate its office in the Appin Business and Shopping Precinct.
- BHPBilliton will continue to operate the 24-hour contact telephone line.
- BHPBilliton will continue to support the operation of the Appin Area Community Working Group and associated community liaison activities.
- BHPBilliton will ensure that during construction, a water cart will be used to minimise the generation of dust.
- BHPBilliton will ensure that all sedimentation structures will be designed and built in accordance with the Landcom publication, “Soils and Construction” Volume 1, Fourth Edition, dated March 2004 and the associated hip pocket handbook.
- Prior to major site earthworks commencing, BHPBilliton will ensure that a sedimentation fence is constructed immediately downstream of the disturbed construction site.
- Prior to major site earthworks commencing, BHPBilliton will ensure that a surface drain is constructed immediately upstream of the site to divert runoff water away from the site.
- Prior to major site earthworks commencing BHPBilliton will prepare for approval by BHPBilliton, a Site Water Management Plan and a Site Soil Management Plan.
- Topsoil will be retained for future revegetation. Topsoil stockpiles will be protected by sedimentation fences installed in accordance with the Landcom publication, “Soils and Construction”.

- BHPBilliton will ensure that all equipment is well maintained. If the noise level of an item of equipment is suspected of being out of specification as defined in Table 6.1 of the Day Design Report (Appendix IIIb), the contractor will ensure that the noise level of the equipment is measured and any necessary maintenance action taken.
- BHPBilliton will ensure that nearby residents are informed of the start of construction activity. The residents will be provided with the contact details of the Contractor's Site Manager. If any noise complaints are received, the Site Manager will implement procedures immediately to investigate and respond to the complaint.
- Prior to vegetation clearing, the successful contractor will obtain from BHPBilliton, written approval to the clearing proposals. This procedure will help to ensure that, where possible, trees with hollows will be retained.
- Weed control procedures will be developed by the successful contractor, and approved by BHPBilliton prior to the commencement of construction.
- BHPBilliton will ensure that a suitably qualified and experienced person will undertake and supervise all weed control and rehabilitation activities.
- Landscaping and revegetation activities will use native species where appropriate. Revegetation in the Cleared Paddock will use species already occurring in that area.
- Prior to major site earthworks commencing, the successful contractor will ensure that a Site Waste Management Plan has been prepared and approved by BHPBilliton. The Plan will ensure that no waste is disposed on site, that recycling is encouraged, and that any disposal of wastes will occur at appropriately approved waste disposal facilities.
- BHPBilliton will ensure that Project design ensures site light spillage is minimised and lights do not shine directly towards residential areas.
- All work will cease in an area if Aboriginal archaeological material is uncovered during the construction of the Switching Station. The Department of Environment and Conservation and the Consulting Archaeologist will be advised should such an event occur. Work will recommence following consultation with the Department of Environment and Conservation and the granting of any necessary approvals.
- BHPBilliton will ensure that the design of the Project directs that the colours used on the visible construction materials are the same as or equivalent to those recommended by Maurice Hayler in his report.

BHPBilliton will ensure that the Project is managed and operated in accordance with the Integral Environmental Management System and that of their own Environmental Policy and Environmental Management System.



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Carbon Steel Materials

Illawarra Coal Holdings Pty Ltd
Asset Development

Legend

- West Cliff Proposed Mine Plan
- Existing West Cliff Workings
- Existing Property Boundaries
- 10m contour interval
- BHPB Lease Area
- Easement for IEA Line
- Service Boreholes



East Appin Switching Station
Location Plan Lot 2 DP 522044
Property and Approvals Issues

Date: 24th January, 2006
Author: P. Booth
Signed Off:

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Horizontal Datum
MGA - Zone 56

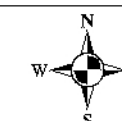
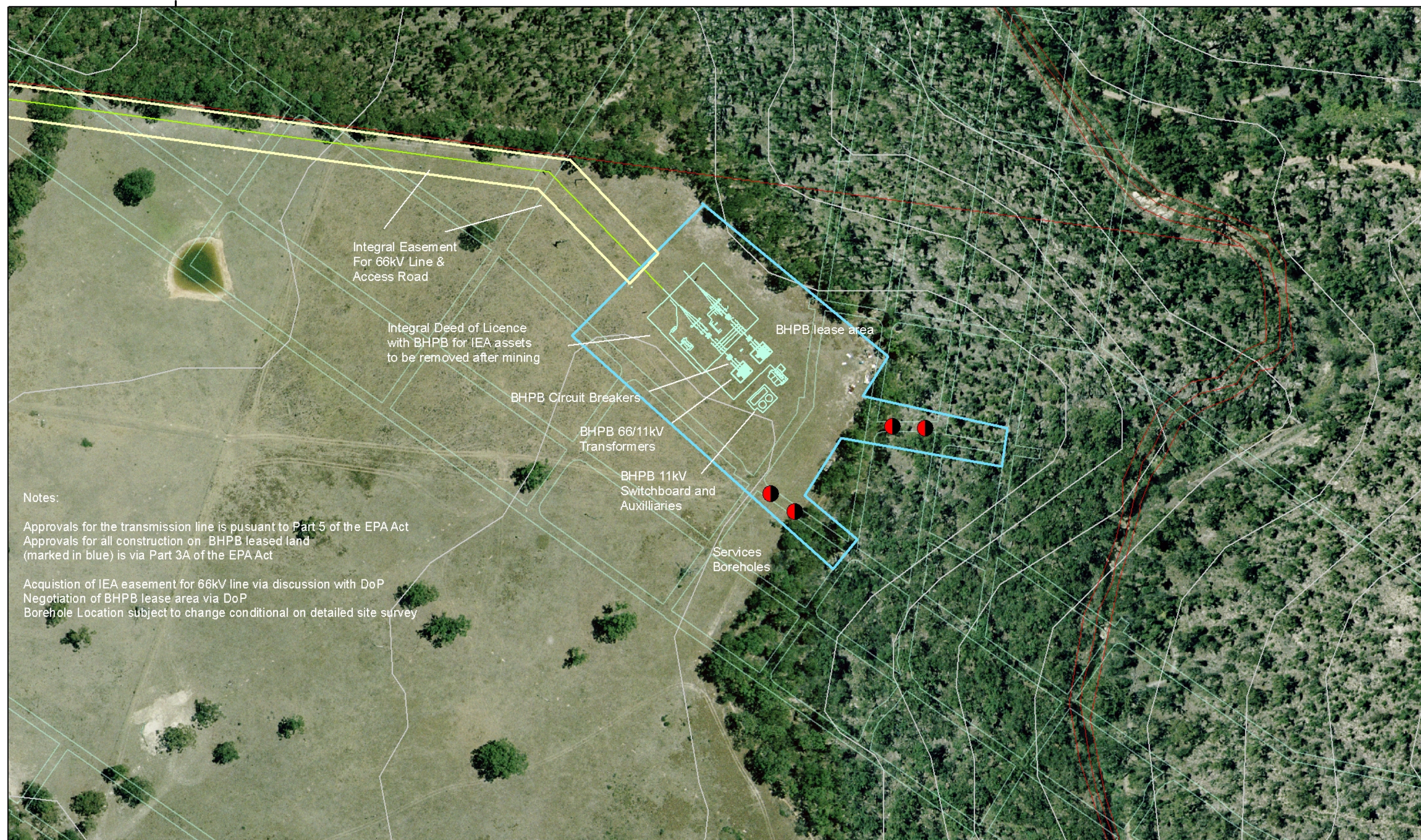


Figure 1
Version 1

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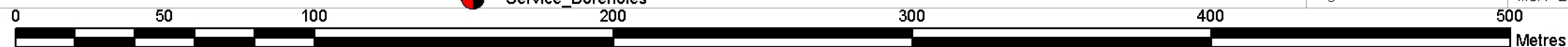
bhpbilliton

Carbon Steel Materials

Illawarra Coal Holdings Pty Ltd
 Asset Development

Legend

- West Cliff Proposed Mine Plan
- Existing West Cliff Workings
- Existing Property Boundaries
- 10m contour interval
- BHPB Lease Area
- Easement for IEA Line
- Service Boreholes
- 66kV_Prefered_Route



East Appin Switching Station
 Location Plan Part Lot 2 DP 522044
 Property and Approvals Issues

Date: 12th Jan 2006
 Author: P. Booth
 Signed Off:

Scale 1:1,850
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 MGA - Zone 56

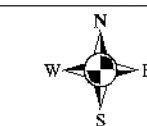


Figure 2
 Version 5

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APPENDIX I

Summary of the Issues and the Level of Assessment

This is Table 4 from the Preliminary Application document.

TABLE 4
SUMMARY OF THE ISSUES AND THE LEVEL OF ASSESSMENT

What are the key issues? Consider the ▪ Extent of the impacts ▪ Nature of the impacts ▪ Environmentally sensitivity of site	What is the extent of the studies required to determine the level of risk?	What is the extent of the studies required to avoid, minimise or manage the impacts so the risks are acceptable?
1. Dust control during construction and along access road.	Comparison with similar activities.	Identify and commit to implementing standard operating control measures.
2. Surface water quality management	Comparison with similar activities.	Identify and commit to implementing standard operating control measures. Preparation of Water Management Plan.
3. Soil management	Comparison with similar activities.	Identify and commit to implementing standard operating control measures. Preparation of Soil Management Plan.
4. Noise during construction and during operation associated with the transformer.	Undertake acoustic assessment of proposed activities in accordance with accepted EPA guidelines and requirements.	Undertake acoustic assessment of proposed activities in accordance with accepted EPA guidelines and requirements.
5. Fauna impacts.	Undertake fauna study in accordance with standard procedures.	Undertake fauna study in accordance with standard procedures.
6. Flora impacts.	Undertake flora study in accordance with standard procedures. Selective clearing around endangered species. Very small area cleared.	Undertake flora study in accordance with standard procedures.
7. Traffic impacts on Appin/Campbelltown Road.	Determine likely levels of traffic and compare with traffic volumes and RTA intersection guidelines.	Determine likely levels of traffic and compare with traffic volumes and RTA intersection guidelines.
8. Waste management	Determine waste streams and volumes and identify appropriate management response. Waste Management Plan.	Determine waste streams and volumes and identify appropriate management response. Waste Management Plan.
9. Electromagnetic field effects.	Obtain assessment from Integral utilising their extensive database and experience.	Obtain assessment from Integral utilising their extensive data base and experience. Incorporate requirements into planning.
10. Switchyard lighting effects.	Define acceptable levels and design accordingly.	Define acceptable levels and design accordingly.
11. Archaeological, historical and heritage implications.	Undertake archaeological and heritage study in accordance with appropriate requirements and incorporate findings into project design.	Undertake archaeological and heritage study in accordance with appropriate requirements and incorporate findings into project design.
12. Visual impact.	y recognised architect.	Undertake visual impact assessment by recognised architect. Incorporate findings and recommendations into planning process.

APPENDIX II

The Director General's requirements for the environmental assessment of the East Appin 66kV Switching Station Project.



NSW GOVERNMENT
Department of Planning

**Office of Sustainable Development
Assessment & Approvals**

Phone: (02) 9228 6487
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Level 1, 23-33 Bridge Street
GPO Box 39
SYDNEY NSW 2001

Mr Richard Walsh
BHP Billiton Illawarra Coal Holdings Pty Ltd
PO Box 514
UNANDERRA NSW 2526

Dear Mr Walsh

**Environmental Assessment Requirements
East Appin 66 kV Switching Station -
West Cliff Coal Mine**

The Department has received your application for the project proposal "East Appin 66 kV Switching Station - West Cliff Coal Mine" (reference number MP: 06_0001).

I have attached a copy of the Director-General's requirements for the project under section 75F of the *Environmental Planning & Assessment Act 1979*.

I would appreciate it if you would contact the Department at least 2 weeks before you propose to submit the draft Environmental Assessment for the project.

If you have any enquiries about these requirements, please contact David Kitto, Acting Director of the Department's Major Development Assessment Branch (9228 6487).

Yours sincerely


Yolande Stone
Deputy Director-General

Director-General's Requirements

Section 75F of the *Environmental Planning and Assessment Act 1979*

Project	East Appin 66 kV Switching Station - West Cliff Coal Mine, which includes: • two 66/11 kV transformers, electricity supply distribution switching station components, two demountable single level control buildings; and • an access road, security fencing, lighting and three boreholes.
Site	Lot 2 DP 522044, Appin Rd, approximately 2.3 km north of Appin Colliery.
Proponent	BHP Billiton Illawarra Coal Holdings Pty Ltd
Date of Issue	20 January 2006
Date of Expiration	20 January 2008
General Requirements	The Environmental Assessment must: • be scientifically rigorous, and prepared in accordance with best practice; • be certified by the author; • include an executive summary; • describe all stages of the project in detail (including rehabilitation of the site); • describe the consultation that was carried out and the issues raised during this consultation; • include a general environmental risk analysis of the project; • focus on the specified Key Assessment Requirements, and in relation to them describe the existing environment, anticipated or potential impacts, and what measures would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor these impacts; • include a draft Statement of Commitments; and • consider the benefits and impacts of the project (as a whole), and justify why it should be approved.
Key Assessment Requirements	• Surface water management – water run off and sediment; • Construction noise; • Construction traffic; • Flora & Fauna; and • Other potential community impacts – electromagnetic field, lighting and visual.
References	The Environmental Assessment must take into account appropriate State government technical and policy guidelines. While not exhaustive, guidelines which may be relevant to the project include the following: • <i>Managing Urban Stormwater: Soils & Construction</i> (Landcom); • <i>Guidelines for Fresh and Marine Water Quality</i> (ANZECC); • <i>Rehabilitation Manual for Australian Streams</i> (Land and Water Resources Research and Development Corporation); • <i>Guidelines for Rehabilitation of Land for Agricultural End Use</i> (Department of Primary Industries); • <i>NSW State Rivers & Estuaries Policy</i>, the various <i>State Groundwater Policy</i> documents, and the relevant <i>Catchment Blueprint</i> (Department of Natural Resources); • <i>Guideline for Application for Subsidence Management Approvals</i> (Department of Primary Industries); • draft <i>Guidelines for Threatened Species Assessment</i> and <i>Guidelines for Developments Adjoining Department of Environment Conservation Land</i> (Department of Environment and Conservation); • <i>NSW Groundwater Dependent Ecosystem Policy</i> (Department of Natural Resources); • <i>Guidelines for Assessment of Aquatic Ecology in EIA</i> (Department of Planning); • <i>Policy and Guidelines for Fish Friendly Waterway Crossings</i> (Department of Primary Industries); • draft <i>Guidelines for Aboriginal Cultural Heritage Assessment and Community</i>

	<i>Consultation</i> (Department of Environment and Conservation); • <i>Assessing Heritage Significance</i> (NSW Heritage Office); • <i>Technical Basis for Guidelines to Minimise Annoyance due to Blasting and Ground Vibration</i> (ANZECC); • <i>NSW Industrial Noise Policy, Environmental Criteria for Road Traffic Noise</i>, and the <i>Environmental Noise Control Manual</i> (Department of Environment and Conservation); • <i>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW</i> (Department of Environment and Conservation); • <i>Guide to Traffic Generating Development and Road Design Guide</i> (Road and Traffic Authority) and relevant Austroad standards; and • <i>Environmental Guidelines: Assessment and Classification and Management of Liquid and Non-Liquid Wastes</i> and <i>Environmental Guidelines: Use of Effluent by Irrigation</i> (Department of Environment and Conservation).
Consultation	During the preparation of the Environmental Assessment, you must consult with the relevant local and State government authorities, service providers, community groups, affected landowners and any affected Commonwealth government authorities.
Deemed refusal period	60 days

APPENDIX IIIa

**Day Design Pty Limited
Consulting Acoustical Engineers**

**Report titled Environmental Noise Impact
East Appin 66kV Switching Station at Appin NSW**

January 2006



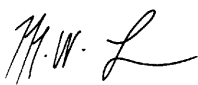
ENVIRONMENTAL NOISE IMPACT
EAST APPIN 66KV SWITCHING STATION
AT APPIN, NSW

REPORT NUMBER: 3486

PREPARED FOR: BHP Billiton Illawarra Coal
C/-Olsen Environmental Consulting
PO Box 101
Figtree NSW 2525

Attention: Mr David Olsen
Telephone: 4228 3144

DATE ISSUED: 25 January 2006

Report Status	Prepared by: Matthew Fishburn	Approved by: Stephen Gauld
Final		

Document R\3486-r1.doc, 11 pages plus attachments

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1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by Olsen Environmental Consulting on behalf of BHP Billiton Illawarra Coal to investigate the environmental noise impact of their proposed East Appin 66kV Switching Station located east of Appin. This commission involves the following:

Scope of Work:

- Inspect the site and environs.
- Measure the background noise levels at critical locations and times.
- Establish the acceptable noise level criteria.
- Quantify noise emissions from the proposed Substation.
- Calculate the level of noise emission, taking into account ground absorption and distance attenuation.
- Prepare a site plan identifying the development and nearby noise sensitive locations.
- Provide reasonable and feasible recommendations for noise control (if necessary).
- Prepare an Environmental Noise Impact Report.

2.0 PROJECT DESCRIPTION & SUMMARY OF FINDINGS

Integral Energy supplies electricity to the majority of Sydney and surrounding suburbs. To sustain this service they have a number of Zone Substations to convert high voltage electricity to standard 240 volt supply. The transformers used for the conversion typically generate a low frequency 'hum' at 100 Hz.

A switching station is proposed to be constructed to enable power to be extracted from the main Integral Energy Line north west of Appin. Power will be directed via an above ground line to a new substation located north of Appin. The substation will convert 66 kV to 11 kV prior to it being transferred to the West Cliff underground workings via cables located in a borehole.

The new substation proposed at a greenfield site at east Appin is currently being used for rural purposes. Two main transformers (each 10 MVA, 66/11kV), one auxiliary transformer (11kV/415V) and one capacitor bank (11kV, 5 MVar) are proposed.

The closest residences to the proposed substation are approximately 800 m west of the site on Appin Road, just north of the Appin town centre.

The ambient noise at the nearest residences is dominated by traffic noise from Appin Road during the day, evening and at night, except early in the morning between approximately 1 am and 5 am, when the ambient noise is the lowest.

The predicted level of noise from the operation of the proposed East Appin 66 kV Switching Station is well below the guidelines in the Environment Protection Authority's Industrial Noise Policy and considered acceptable at all existing nearby residences.



3.0 NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis were made with sound instrumentation as follows:

Table 3.1 Noise Instrumentation

Description	Model No.	Serial No.
Modular Precision Sound Analyser	B&K 2260	244 3406
Condenser Microphone 0.5" diameter	B&K 4189	244 0653
Acoustical Calibrator	B&K 4231	243 9033
Microphone Windscreen	Acoustically transparent foam	
Infobyte Noise Logger	iM3	33
Condenser Microphone 0.5" diameter	MK 250	3074
Microphone Windscreen	Acoustically transparent foam	

The **B&K 2260 Sound Analyser** is a real-time precision integrating sound level meter with octave and third octave filters, that samples noise at a rate of 10 samples per second. The B&K 2260 provides L_{eq} , L_1 , L_{10} , L_{50} and L_{90} statistical data at 15 minute intervals (longer or shorter intervals optional) over the desired monitoring period. Results are normally downloaded to computer for rapid processing.

All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.3 dB during attended measurements and within 1 dB for long-term measurements. No adjustments for instrument drift during the measurement period were warranted.



4.0 MEASURED AMBIENT NOISE LEVELS

In order to assess the severity of a possible environmental noise problem in a residential area it is necessary to measure the ambient background noise level at the times and locations of worst possible annoyance. The lower the background noise level, the more perceptible the intrusive noise becomes and the more potentially annoying.

The ambient L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measuring period (typically 15 minutes).

The Rating Background Level (RBL) is defined by the Department of Environment and Conservation as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over 7 days during the proposed days and times of operation (EPA, 2000).

The places of worst possible annoyance are residents along Appin Rd, Appin. These residences are shown on the attached Site Plan 3486 Figure 1. The times of worst possible annoyance will be from 1 am to 5 am when ambient noise levels are typically at their lowest.

Ambient L_{90} background noise levels were measured at Location "A" shown on the Site Plan over seven (7) days from Friday 9th December, 2005 to Friday 16th December, 2005. These levels are presented in the attached Figure 2 and also in Table 4.1 below.

Table 4.1 Rating Background Level

Noise Measurement Location	Time Period	Rating Background Level
Location 'A' – 180 Appin Road, Appin	Day (7am to 6 pm)	42 dBA
	Evening (6 pm to 10 pm)	39 dBA
	Night (10 pm to 7 am)	31 dBA

Meteorological conditions during the testing typically consisted of temperatures of 10 to 28 °C. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor area.



5.0 ACCEPTABLE NOISE LEVELS

5.1 NSW Industrial Noise Policy

The Environment Protection Authority published their NSW Industrial Noise Policy (EPA, 2000) in January 2000. The Environment Protection Authority has since been amalgamated with a number of other State Government departments into the Department of Environment and Conservation (DEC). The Industrial Noise Policy is specifically aimed at assessing noise from industrial noise sources scheduled under the Protection of the Environment Operations Act 1997 (POEO, 1997).

The appropriate regulatory authority (DEC) may, by notice in writing given to such a person, prohibit the person from causing, permitting or allowing:

- (a) any specified activity to be carried on at the premises, or
- (b) any specified article to be used or operated at the premises,

or both, in such a manner as to cause the emission from the premises, at all times or on specified days, or between specified times on all days or on specified days, of noise that, when measured at any specified point (whether within or outside the premises,) is in excess of a specified level.

It is an offence to contravene a noise control notice. Prior to being issued with a noise control notice, no offence has been committed.

The Industrial Noise Policy provides a useful framework to assess noise emission from non-scheduled premises, whether that premises produces offensive or non-offensive noise.

The Protection of the Environment Operations Act 1997 defines "Offensive Noise" as noise:

- (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:
 - (i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or
 - (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or
- (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulation.

The NSW Industrial Noise Policy will be used in this report in determining whether the level of noise is considered offensive or not.



5.2 Residential Receptor Noise Intrusiveness Criteria

The DEC states in Section 2.1 of its NSW Industrial Noise Policy (January 2000) that the L_{eq} level of noise intrusion from broad-band industrial noise sources may be up to 5 dBA above the L_{90} background noise level at the receptor without being considered offensive (EPA, 2000, Section 2.1).

The Rating Background Level in North Appin was 42 dBA during the daytime, 39 dBA in the evening and 31 dBA at night. Therefore the acceptable L_{eq} noise intrusiveness criteria for **broadband noise** in this area is;

- $(42 + 5 =) 47$ dBA during the day,
- $(39 + 5 =) 44$ dBA in the evening and
- $(31 + 5 =) 36$ dBA at night.

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. Correction factors may be applied to the noise intrusiveness criteria to determine the project specific criteria.

The tonality and low frequency modifying factors are potentially applicable to the assessment and are presented in the attached Datasheet AC 500-9.

The Rating Background Level in east Appin was 42 dBA during the daytime, 39 dBA in the evening and 31 dBA at night. Therefore the acceptable L_{eq} noise intrusiveness criteria for **tonal and/or low frequency noise** in this area is;

- $(42 + 5 - 5 =) 42$ dBA during the day,
- $(39 + 5 - 5 =) 39$ dBA in the evening and
- $(31 + 5 - 5 =) 31$ dBA at night.

5.3 Residential Noise Amenity Criterion

Depending on the type of area in which the noise is being made, there is a certain reasonable expectancy for noise amenity. Table 2.1 of the NSW Industrial Noise Policy provides a schedule of recommended L_{eq} industrial noise levels that under normal circumstances should not be exceeded. If successive developments occur near a residential area, each one allowing a criterion of background noise level plus 5 dBA, the ambient noise level will gradually creep higher.

Compliance with the Noise Amenity levels in Table 2.1 will limit ambient noise creep. For example in a rural residential area, the L_{eq} noise emission level may not exceed 50 to 55 dBA in the daytime (7 am to 6 pm), 45 to 50 dBA in the evening (6 pm to 10 pm) and 40 to 45 dBA during the night (10 pm to 7 am).

Wherever the existing L_{eq} noise level from industrial noise sources approaches or exceeds the Amenity criterion at a critical receptor location, the intrusive L_{eq} noise from the noise source in



question must be reduced to a level that may be as much as 10 dBA below the existing L_{eq} industrial noise level.

The existing L_{eq} noise level was measured to be 53 dBA during the day, 53 dBA during the evening and 49 dBA at night.

Therefore the amenity criteria is:

- (53 – 10=) **43 dBA during the day,**
- (53 – 10=) **43 dBA in the evening and**
- (49 – 10=) **39 dBA at night.**

5.4 Project Specific Noise Criteria

When all the above factors are considered, we find that the most stringent noise criteria are:

- **43 dBA for broadband noise sources, and 42 dBA for tonal noise sources** during the day,
- **43 dBA for broadband noise sources, and 39 dBA for tonal noise sources** in the evening,
- **36 dBA for broadband noise sources, and 31 dBA for tonal noise sources** at night.

These criteria apply at the most-affected point on or within the residential property boundary – or, if that is more than 30 metres from the residence, at the most-affected point within 30 metres of the residence. For upper floors, the noise is assessed outside the nearest window.



6.0 EAST APPIN 66 KV SWITCHING STATION NOISE EMISSION

The main sources of noise from the proposed East Appin 66 kV Switching Station are the transformers and the capacitor bank that will operate continually throughout the day and night. The noise level from these items of plant does not change appreciably from the day to the night and therefore the calculated noise level at night will be the worst-case scenario. Two transformers, one auxiliary transformer and one capacitor bank are proposed.

6.1 Measured Sound Power Levels

Noise surveys have been carried out by Day Design at a number of Integral Energy Substations around Sydney to determine the level and character of high voltage transformers. Typical sound power data have been used for the proposed transformers and a schedule of the sound power levels is given in Table 6.1 below.

Table 6.1 L_{eq} Sound Power Levels

Description	Sound Power Levels (dB)							
	at Third Octave Band Centre Frequencies (Hz)							
	dBA	50	100	200	400	800	1.6k	3.15k
		63	125	250	500	1k	2k	4k
		80	160	315	630	1.25k	2.5k	5k
No 1 Transformer, 66/11kV, 10 MVA (proposed)	75*	82	83	75	71	67	62	57
		73	74	64	63	65	62	55
		82	69	73	62	60	55	54
No 2 Transformer 66/11kV, 10 MVA (proposed)	75*	82	83	75	71	67	62	57
		73	74	64	63	65	62	55
		82	69	73	62	60	55	54
No 1 Capacitor Bank 11 kV, 5 MVA (proposed)	73*	66	69	69	71	61	52	63
		66	64	61	64	58	46	65
		65	64	69	62	55	43	54
Auxiliary Transformer 11 kV/415 V (proposed)	59*	52	59	58	52	51	47	42
		56	52	49	50	49	47	45
		54	50	52	50	45	43	45
Typical Cooling Fan	70**	65	60	64	65	66	63	61

*Noise levels have been taken from a typical transformers and capacitor bank data.

**Cooling fan noise level data have been taken from a typical fan manufacturer's data.



6.2 Calculated Noise Levels at Receptor Locations

The calculated L_{eq} noise levels at the two nearest receptor locations is calculated to be as shown below in Table 6.2. The assessment location is 30 metres away from the residential building and closer to the substation in each case.

Table 6.2 Calculated L_{eq} Noise Levels at Receptor Locations

Receptor Location	Acceptable Level	Calculated Level	Tonal	Compliance
Location 'B' 180 Appin Road, Appin	36 dBA	< 20 dBA	No	Yes
Location 'C' 196 Appin Road, Appin	36 dBA	< 20 dBA	No	Yes

At a distance of approximately 800 metres, the calculated sound pressure level at the two nearest receptor locations in Appin will be less than 20 dBA (and inaudible), which is less than the annoyance criterion of 36 dBA night criterion and therefore acceptable.

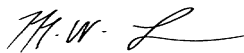
From these above predictions, we conclude that the proposed East Appin 66 kV Switching Station at Appin will not require any specific noise control measures to comply with the noise guidelines recommended in the NSW Industrial Noise Policy.



7.0 NOISE IMPACT STATEMENT

Based on past noise emission measurements of typical transformers and capacitor banks, our computations show that the calculated noise from the proposed East Appin 66 kV Switching Station will be within the guidelines in the NSW Industrial Noise Policy at the nearest residential premises.

We are of the opinion that sound emitted from this development will not cause “offensive noise” as defined by the Protection of the Environment Operations Act 1997.



Matthew Fishburn, BE(Mech) Hons, MAAS

Consulting Acoustical Engineer
for and on behalf of Day Design Pty Ltd.

A.A.A.C. MEMBERSHIP

Day Design Pty Ltd is a member company of the Association of Australian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

Attachments:

- Figure 1 – Location Plan
- Figure 2 – Ambient Noise Survey
- Figure 3 – Site Plan
- AC 108-1 to 4 – Glossary of Acoustic Terms
- AC 500-9 – Modifying Factor Correction

References:

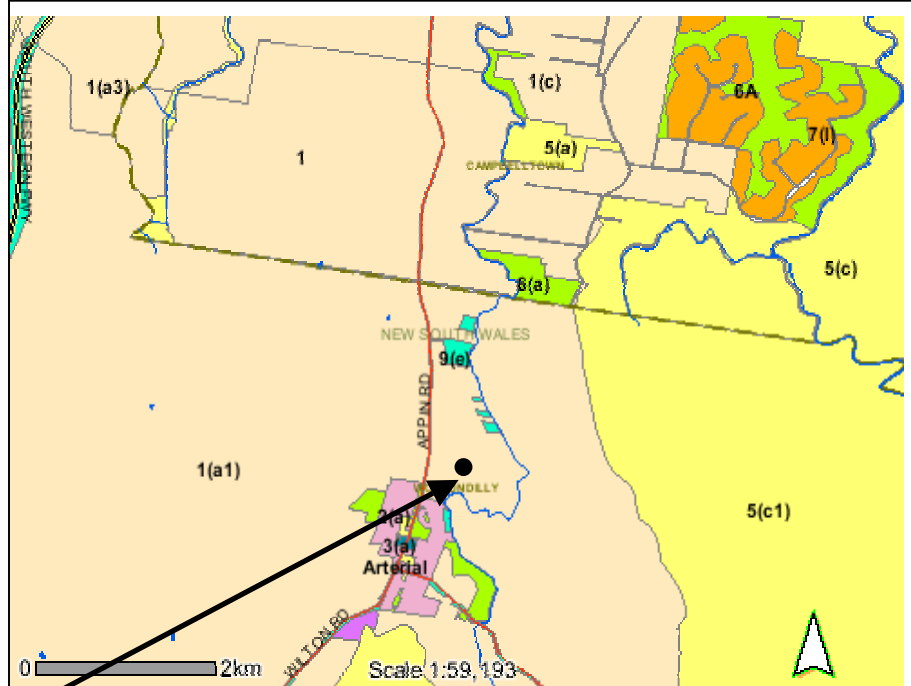
- EPA, 2000, *Industrial Noise Policy*, NSW Environmental Protection Authority, Jan 2000.
- POEO, 1997, *Protection of the Environment Operations Act 1997*, Act No 156, 19 Dec.



DAY DESIGN

East Appin 66 kV Switching Station Location Plan

3486
Figure 1

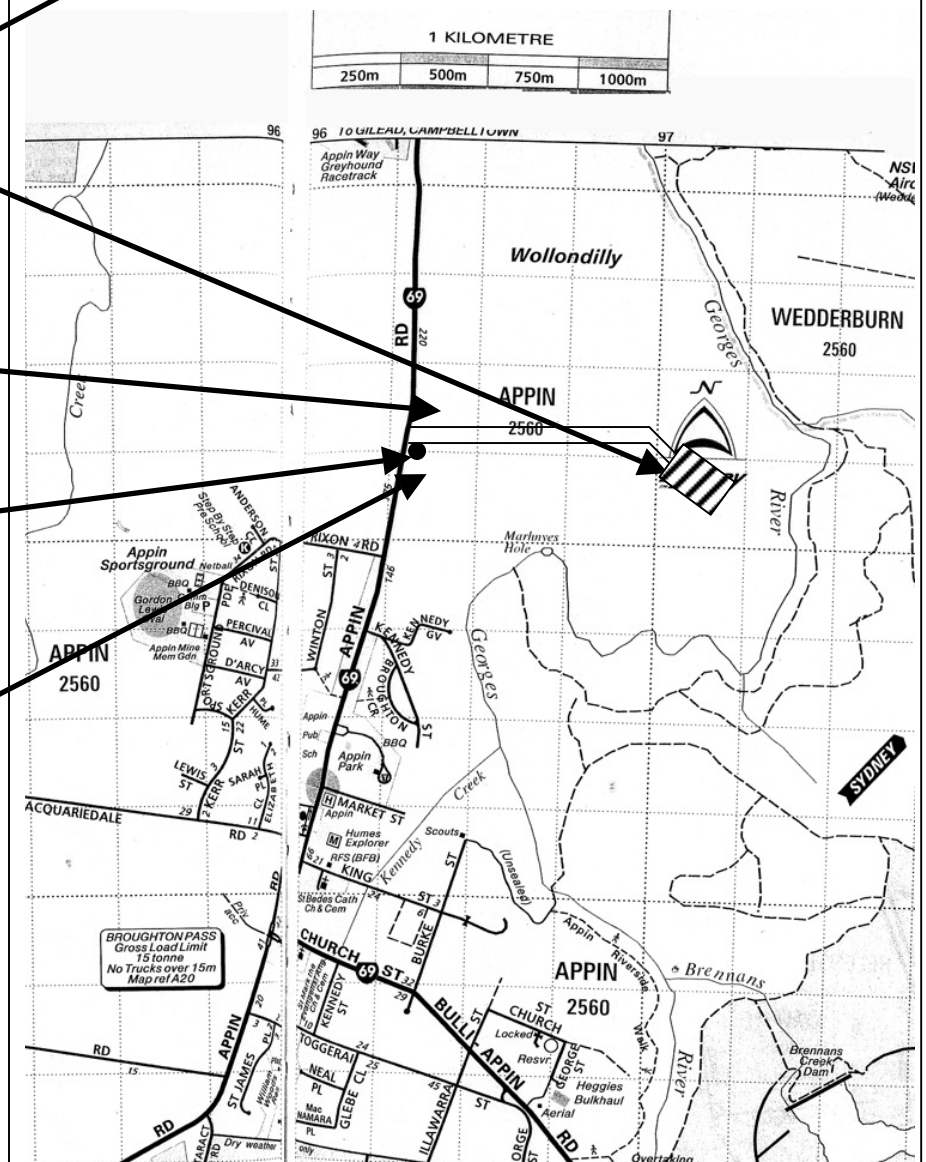


East Appin 66 kV Switching Station

Location C:
196 Appin Road
Appin

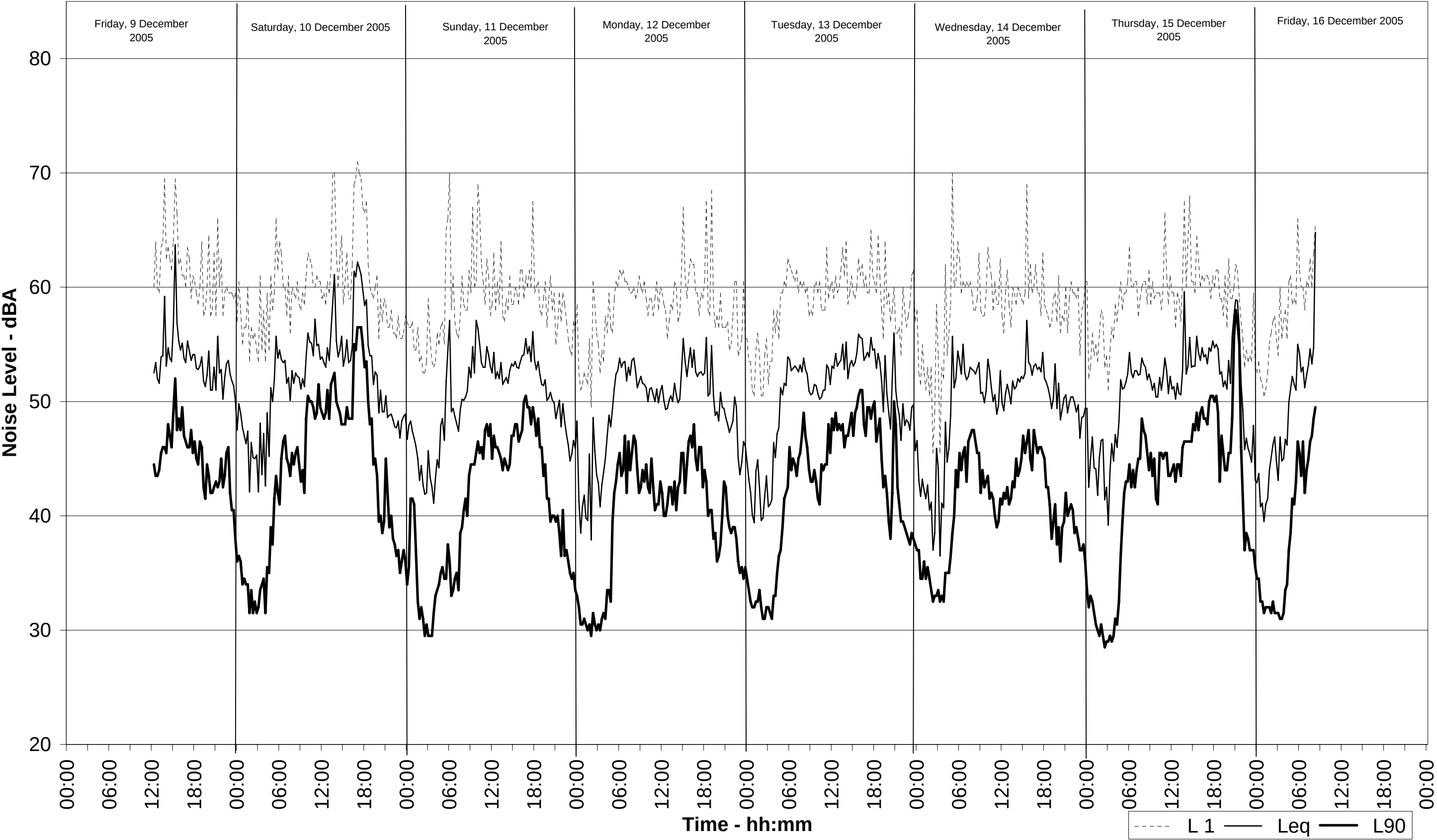
Logger Location A:

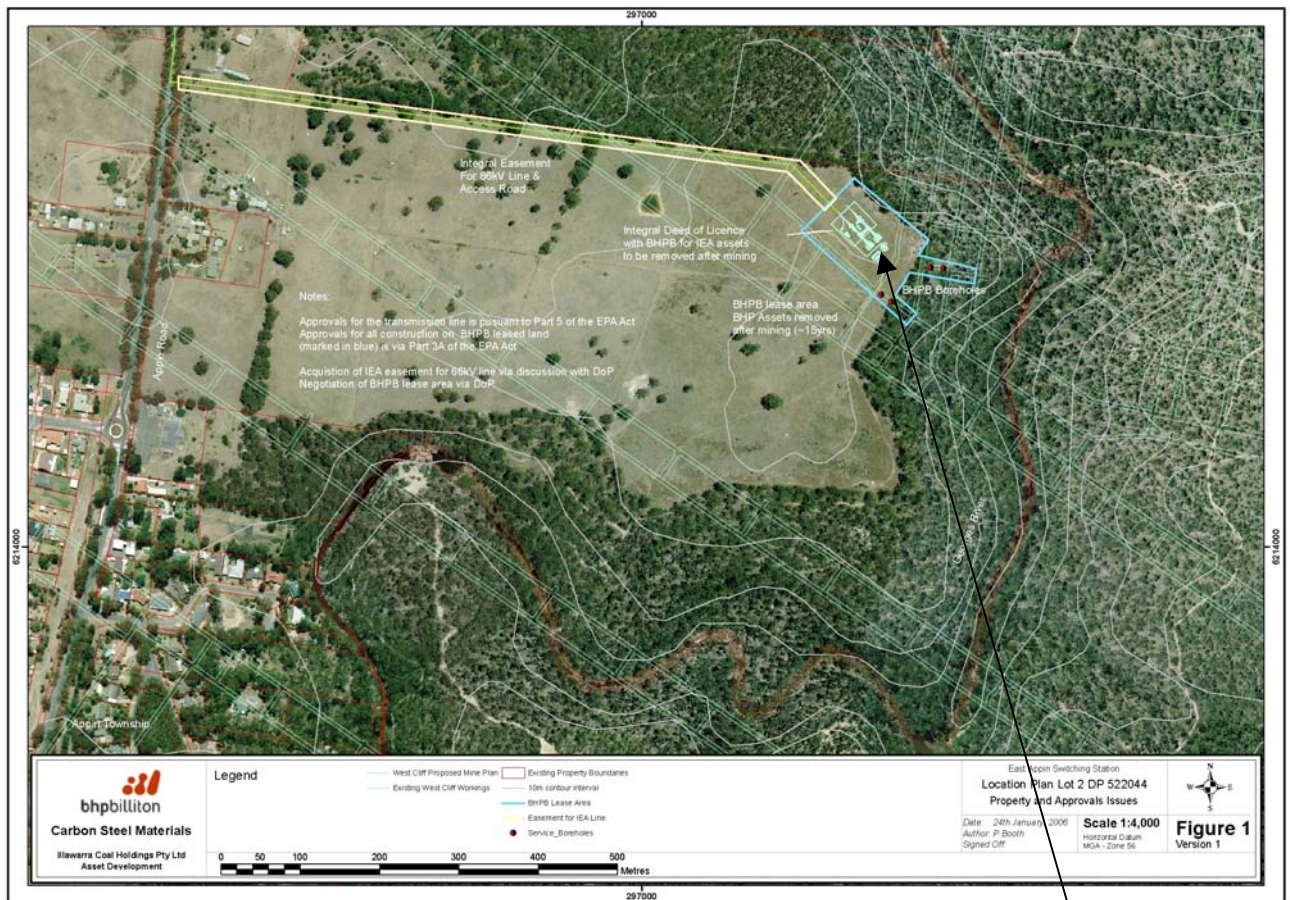
Location B:
180 Appin Road
Appin



Ambient Noise Survey

Located at 180 Appin Road, Appin, NSW





Proposed East Appin 66 kV
Switching Station

Table 4.1 Modifying factor corrections

(See definitions in Section 4.2)

Factor	Assessment/ Measurement	When to apply	Correction ¹	Comments
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: - 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz - 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive - 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz	5 dB ²	Narrow-band frequency analysis may be required to precisely detect occurrence
Low frequency noise	Measurement of C-weighted and A-weighted level	Measure/assess C- and A-weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more	5 dB ²	C-weighting is designed to be more responsive to low-frequency noise
Impulsive noise	A-weighted fast response and impulse response	If difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2 dB	Apply difference in measured levels as the correction, up to a maximum of 5 dB.	Characterised by a short rise time of 35 milliseconds (ms) and decay time of 1.5s
Intermittent noise	Subjectively assessed	Level varies by more than 5 dB	5 dB	Adjustment to be applied for night-time only .
Duration	Single-event noise duration may range from 1.5 min to 2.5 h	One event in any 24-hour period	0 to –20 dB(A)	The acceptable noise level may be increased by an adjustment depending on duration of noise. (See Table 4.2)
Maximum Adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated	Maximum correction of 10 dB(A) ² (excluding duration correction)	

Notes:

1. Corrections to be added to the measured or predicted levels.
2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range.

ACOUSTICAL Pertaining to the science of sound, including the generation, propagation, effects and control of both noise and vibration.

AMBIENT NOISE The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including road traffic, factories, wind in the trees, birds, insects, animals, etc..

AUDIBLE means that a sound can be heard. However, there are a wide range of audibility grades, varying from “barely audible” to “just audible”, “clearly audible” and “prominent”. Chapter 83 of the NSW Environment Protection Authority – Environmental Noise Control Manual (1985) states:

“noise from a particular source might be offensive if it is clearly audible, distinct from the prevailing background noise and of a volume or character that a reasonable person would be conscious of the intrusion and find it annoying or disruptive”.

It follows that the word “audible” in an environmental noise context means “clearly audible”.

BACKGROUND NOISE LEVEL Silence does not exist in the natural or the built-environment, only varying degrees of noise. The Background Noise Level is the average minimum dBA level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by cicadas, lawnmowers, etc. It is quantified by the L_{A90} or the dBA noise level that is exceeded for 90 % of the measurement period (usually 15 minutes).

- **Assessment Background Level (ABL)** is the single figure background level representing each assessment period – day, evening and night (i.e. three assessment background levels are determined for each 24hr period of the monitoring period). Determination of the assessment background level is by calculating the tenth percentile (the lowest tenth percent value) of the background levels (L_{A90}) for each period (Refer: NSW Industrial Noise Policy, 2000).
- **Rating Background Level (RBL)** as specified by the Environment Protection Authority is the overall single figure (L_{A90}) background noise level representing an assessment period (day, evening or night) over a monitoring period of (normally) three to seven days.

The RBL for an assessment period is the median of the daily lowest tenth percentile of L_{90} background noise levels.

If the measured background noise level is less than 30 dBA, then the Rating Background Level (RBL) is considered to be 30 dBA.

DECIBEL The human ear has a vast sound-sensitivity range of over a thousand billion to one. The decibel is a logarithmic unit that allows this same range to be compressed into a somewhat more comprehensible range of 0 to 120 dB. The decibel is ten times the logarithm of the ratio of a sound level to a reference sound level. See also Sound Pressure Level and Sound Power Level.

Decibel noise levels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dBA, and another similar machine is placed beside it, the level will increase to 53 dBA, not 100 dBA. Ten similar machines placed side by side increase the sound level by 10 dBA, and one hundred machines increase the sound level by 20 dBA.

dBA The human ear is less sensitive to low frequency sound than high frequency sound. We are most sensitive to high frequency sounds, such as a child's scream. Sound level meters have an inbuilt weighting network, termed the dBA scale, that approximates the human loudness response at quiet sound levels (roughly approximates the 40 phon equal loudness contour).

However, the dBA sound level provides a poor indication of loudness for sounds that are dominated by low frequency components (below 250 Hz). If the difference between the "C" weighted and the "A" weighted sound level is 15 dB or more, then the NSW Industrial Noise Policy recommends a 5 dBA penalty be applied to the measured dBA level.

dB The dB scale of a sound level meter is similar to the dBA scale defined above, except that at high sound intensity levels, the human ear frequency response is more linear. The dB scale approximates the 100 phon equal loudness contour.

EQUIVALENT CONTINUOUS NOISE LEVEL, L_{Aeq}

Many noises, such as road traffic or construction noise, vary continually in level over a period of time. More sophisticated sound level meters have an integrating electronic device inbuilt, which average the A weighted sound pressure levels over a period of time and then display the energy average or L_{Aeq} sound level. Because the decibel scale is a logarithmic ratio the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

FREE FIELD This is a sound field not subject to significant reflection of acoustical energy. A free field over a reflecting plane is usually outdoors with the noise source resting on hard flat ground, and not closer than 6 metres to any large flat object such as a fence or wall; or inside an anechoic chamber.

FREQUENCY The number of oscillations or cycles of a wave motion per unit time, the SI unit being the Hertz, or one cycle per second.

IMPULSE NOISE An impulse noise is typified by a sudden rise time and a rapid sound decay, such as a hammer blow, rifle shot or balloon burst.

INTRUSIVE NOISE LEVEL, L_{Aeq} The level of noise from a factory, place of entertainment, etc. in NSW is assessed on the basis of the average maximum noise level, or the L_{Aeq} (15 min). This is the energy average A weighted noise level measured over any 15 minute period.

LOUDNESS The degree to which a sound is audible to a listener is termed the loudness. The human ear perceives a 10 dBA noise level increase as a doubling of loudness and a 20 dBA noise increase as a quadrupling of the loudness.

MAXIMUM NOISE LEVEL, L_{Amax} The rms maximum sound pressure level measured on the "A" scale of a sound level meter during a noise survey is the L_{Amax} noise level. It may be measured using either the Fast or Slow response time of the meter. This should be stated.

NOISE Noise is unwanted sound. Sound is wave motion within matter, be it gaseous, liquid or solid. "Noise includes sound and vibration".

NOISE RATING NUMBERS A set of empirically developed equal loudness curves has been adopted as Australian Standard AS1469-1983. These curves allow the loudness of a noise to be described with a single NR number. The Noise Rating number is that curve which touches the highest level on the measured spectrum of the subject noise. For broadband noise such as fans and engines, the NR number often equals the dBA level minus five.

NOISE REDUCTION COEFFICIENT See: "Sound Absorption Coefficient"

OFFENSIVE NOISE

(Reference: Dictionary of the Protection of the Environment Operations Act 1997).

"Offensive Noise means noise:

- (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*
 - (i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or*
 - (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
- (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."*

PEAK NOISE LEVEL, $L_{C\text{ peak}}$ The "Peak" level is the maximum instantaneous dBA sound pressure level. This is not an RMS level. It is an important descriptor for an impulsive noise wave front especially with regard to the assessment of Hearing Hazard due to impact noise.

PINK NOISE Pink noise is a broadband noise with an equal amount of energy in each octave or third octave band width. Because of this, Pink Noise has more energy at the lower frequencies than White Noise and is used widely for Sound Transmission Loss testing.

REVERBERATION TIME, T_{60} The time in seconds, after a sound signal has ceased, for the sound level inside a room to decay by 60 dB. The first 5 dB decay is often ignored, because of fluctuations that occur while reverberant sound conditions are being established in the room. The decay time for the next 30 dB is measured and the result doubled to determine the T_{60} . The Early Decay Time (EDT) is the slope of the decay curve in the first 10 dB normalised to 60 dB.

SOUND ABSORPTION COEFFICIENT, α Sound is absorbed in porous materials by the viscous conversion of sound energy to heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, α . An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average α from 250 to 2000 Hz is termed the Noise Reduction Coefficient (NRC).

SOUND ATTENUATION If an enclosure is placed around a machine, or a silencer is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 30 dBA, reduces the sound energy by one thousand times.

SOUND PRESSURE LEVEL, L_p The level of sound measured on a sound level meter and expressed in decibels, dB, dBA, dBC, etc.. $L_p = 20 \times \log (P/P_0) \dots \text{dB}$

where P is the rms sound pressure in Pascal and P_0 is a reference sound pressure of 20 μPa .

L_p varies with distance from a noise source.

SOUND POWER LEVEL, L_w The Sound Power Level of a noise source is an absolute that does not vary with distance or with a different acoustic environment.

$$L_w = L_p + 10 \log A \dots \text{dB, re: 1pW,}$$

where A is the measurement noise-emission area in square metres in a free field.

SOUND TRANSMISSION CLASS (STC) An internationally standardised method of rating the sound transmission loss of partition walls to indicate the decibels of noise reduction of a human voice from one side to the other. (Refer: Australian Standard AS1276 – 1979)

SOUND TRANSMISSION LOSS The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL EXCEEDENCE SOUND LEVELS, L_{A90} , L_{A10} , L_{A1} , etc.

Noise which varies in level over a specific period of time (usually 15 minutes) may be quantified in terms of various statistical descriptors:

The L_{A90} is the dBA level exceeded for 90 % of the time. In NSW the L_{A90} is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

The L_{A10} is the dBA level that is exceeded for 10 % of the time. In NSW the L_{A10} measured over a period of 10 to 15 minutes. It was until recently used to describe the average maximum noise level, but has largely been replaced by the L_{Aeq} for describing level-varying noise.

The L_{A1} is the dBA level that is exceeded for 1 % of the time. In NSW the L_{A1} may be used for describing short-term noise levels such as could cause sleep arousal during the night.

STEADY NOISE. Noise, which varies in level by 6 dBA or less, over the period of interest with the time-weighting set to “Fast”, is considered to be “steady”. (Refer AS 1055.1 1997)

WEIGHTED SOUND REDUCTION INDEX, R_w This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 to 3,150 Hertz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999).

Internal partition wall $R_w + C$ ratings are frequency weighted to simulate insulation from human voice noise. The $R_w + C$ is always similar in value to the STC rating value. External walls, doors and windows may be $R_w + C_{tr}$ rated to simulate insulation from road traffic noise. This is normally a lower number than the STC rating value.

WHITE NOISE White noise is broadband random noise whose spectral density is constant across its entire frequency range. The sound power is the same for equal bandwidths from low to high frequencies. Because the higher frequency octave bands cover a wider spectrum, white noise has more energy at the higher frequencies and sounds like a hiss.

APPENDIX IIIb

**Day Design Pty Limited
Consulting Acoustical Engineers**

**Report titled Construction Noise Impact
East Appin Switching Station at Appin NSW**

January 2006



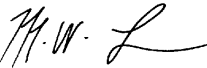
CONSTRUCTION NOISE IMPACT
EAST APPIN 66 KV SWITCHING STATION
AT APPIN, NSW

REPORT NUMBER: 3486-2

PREPARED FOR: BHP Billiton Illawarra Coal
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DATE ISSUED: 25 January 2006

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Final		

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1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by Olsen Environmental Consulting on behalf of BHP Billiton Illawarra Coal to investigate the environmental noise impact during construction of their proposed East Appin 66 kV Switching Station located just east of the Appin town centre. This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Establish acceptable noise level criterion
- Quantify noise emissions from construction activities
- Calculate the level of noise emission, taking into account, ground absorption, screen walls and distance attenuation
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Provide recommendations for noise control (if necessary)
- Prepare a Construction Noise Impact Report.

2.0 PROJECT DESCRIPTION & SUMMARY OF FINDINGS

Integral Energy supplies electricity to the majority of Sydney and surrounding suburbs. To sustain this service they have a number of Zone Substations to convert high voltage electricity to standard 240 volt supply. The transformers used for the conversion typically generate a low frequency 'hum' at 100 Hz.

A switching station is proposed to enable power to be extracted from the main Integral Energy Line north west of Appin. Power will be directed via an above ground line to a new substation located east of Appin. The substation will convert 66 kV to 11 kV prior to it being transferred to the West Cliff underground workings via cables located in a borehole.

The new substation proposed at a greenfield site at east Appin is currently being used for rural purposes. Two main transformers (each 10 MVA, 66/11kV), one auxiliary transformer (11kV/415V) and one capacitor bank (11kV, 5 MVar) are proposed.

The closest residences to the proposed substation are approximately 800 m west of the site on Appin Road, just east of the Appin town centre.

The construction activities will occur from:

- Monday to Friday, 7 am to 6 pm,
- Saturday, 7 am to 1 pm if inaudible on residential premises otherwise: 8 am to 1 pm,
- No construction work to take place on Sundays or Public Holidays.

Measurements and computations show that, the level of noise emitted by the proposed construction works at the East Appin 66 kV Switching Station complies with the construction noise criteria at the nearest and most affected receptor locations.



3.0 NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis were made with sound instrumentation as follows:

Table 3.1 Noise Instrumentation

Description	Model No.	Serial No.
Modular Precision Sound Analyser	B&K 2260	244 3406
Condenser Microphone 0.5" diameter	B&K 4189	244 0653
Acoustical Calibrator	B&K 4231	243 9033
Microphone Windscreen	Acoustically transparent foam	
Infobyte Noise Logger	iM3	33
Condenser Microphone 0.5" diameter	MK 250	3074
Microphone Windscreen	Acoustically transparent foam	

The **B&K 2260 Sound Analyser** is a real-time precision integrating sound level meter with octave and third octave filters, that samples noise at a rate of 10 samples per second. The B&K 2260 provides L_{eq} , L_1 , L_{10} , L_{50} and L_{90} statistical data at 15 minute intervals (longer or shorter intervals optional) over the desired monitoring period. Results are normally downloaded to computer for rapid processing.

All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.3 dB during attended measurements and within 1 dB for long-term measurements. No adjustments for instrument drift during the measurement period were warranted.



4.0 MEASURED AMBIENT NOISE LEVELS

In order to assess the severity of a possible environmental noise problem in a residential area it is necessary to measure the ambient background noise level at the times and locations of worst possible annoyance. The lower the background noise level, the more perceptible the intrusive noise becomes and the more potentially annoying.

The ambient L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measuring period (typically 15 minutes).

The Rating Background Level (RBL) is defined by the Department of Environment and Conservation as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over 7 days during the proposed days and times of operation (EPA, 2000).

The places of worst possible annoyance are residents along Appin Rd, Appin. These residences are shown on the attached Site Plan 3486 Figure 1. The times of worst possible annoyance will be from 1 am to 5 am when ambient noise levels are typically at their lowest.

Ambient L_{90} background noise levels were measured at Location "A" shown on the Site Plan over seven (7) days from Friday 9th December, 2005 to Friday 16th December, 2005. These levels are presented in the attached Figure 2 and also in Table 4.1 below.

Table 4.1 Rating Background Level

Noise Measurement Location	Time Period	Rating Background Level
Location 'A' – 180 Appin Road, Appin	Day (7am to 6 pm)	42 dBA
	Evening (6 pm to 10 pm)	39 dBA
	Night (10 pm to 7 am)	31 dBA

Meteorological conditions during the testing typically consisted of temperatures of 10 to 28 °C. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor area.



5.0 CONSTRUCTION NOISE CRITERIA

The EPA states in Chapter 171 of the Environmental Noise Control Manual the acceptable noise level at nearby residences due to construction activities. Chapter 171 is extracted below in italics:

Level Restrictions

- (i) *Construction period of 4 weeks and under.*

The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dB(A).

- (ii) *Construction period greater than 4 weeks and not exceeding 26 weeks.*

The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dB(A).

Time Restrictions

Monday to Friday, 7 am to 6 pm.

Saturday, 7 am to 1 pm if inaudible on residential premises, otherwise: 8 am to 1 pm.

No construction work to take place on Sundays or Public Holidays.

Silencing

All possible steps should be taken to silence construction site equipment. It is particularly important that silenced equipment should be used on road or rail works where 24 hour operation is necessary.

The anticipated construction period will not exceed 26 weeks. Therefore, the L_{A10} construction noise levels should not exceed the background level by more than 10 dBA when measured over a 15 minute period at the most affected residence.

In line with the change from $L_{10, (15 \text{ min})}$ to $L_{eq, (15 \text{ min})}$ in the NSW Industrial Noise Policy (2000), we have adopted $L_{eq, (15 \text{ min})}$ for all noise criteria.

During normal construction times of 7 am to 6 pm the background noise level is 42 dBA. Therefore the acceptable L_{eq} construction noise criteria are as shown in Table 5.4 below.

Table 5.1 Construction Noise Criteria

Construction Period	Max. Acceptable Noise Level L_{eq} (dBA)
4 to 26 weeks	(42 + 10 =) 52 dBA*

*This criteria is to be assessed at the most affected point on or within the residential property boundary – or, if that is more than 30 m from the residence, at the most-affected point within 30 m of the residence during construction hours.



6.0 CONSTRUCTION EQUIPMENT NOISE EMISSION

The earthworks and building works required for this site will necessitate the use of a variety of heavy construction equipment, including an excavator, drilling rig, crane, roller, grader, loader, and trucks.

Noise data was gathered from a number of sources, including previous projects and equipment manufacturer's technical specifications. Machinery complying with the noise levels shown below will typically be less than five years old and be well maintained and operated to comply with the Environment Protection Authority "best management practice" (BMP). A schedule of the sound power levels for the equipment is given in Table 6.1 below.

Table 6.1 L_{eq} (15 min) Machinery Sound Power Levels

Description	Sound Power Levels - dB (re 1 pW)								
	dBA	63	125	250	500	1k	2k	4k	8k
Excavator – type 345	109	107	114	107	106	103	101	94	88
Drilling Rig	103	100	106	104	99	98	95	89	80
Crane (60 kW)	107	104	110	108	103	102	99	93	84
Compacting Roller	102	99	105	103	98	97	94	88	79
Grader	102	99	105	103	98	97	94	88	79
Loader (50 kW)	112	110	117	110	109	106	104	97	91
20 to 30 Tonne Truck	105	102	108	106	101	100	97	91	82

If the noise from any one item of equipment is suspected to be excessive, it will be possible to check compliance with the above industry standards by measurement of sound pressure level at a distance of approximately 7 metres. The measured sound pressure level at this distance will be approximately 25 dBA less than the sound power levels listed in Table 6.1.



7.0 PREDICTED NOISE LEVELS AT RESIDENCES

The construction of the East Appin 66 kV Switching Station will generate noise both at the site itself and from vehicles accessing the site from Appin Road. Both areas of noise impact are individually assessed as outlined in Sections 7.1 and 7.2 below.

7.1 Substation Construction

During the construction of the substation, the greatest sustained level of noise emission will occur when several items of plant are used concurrently. Construction is likely to necessitate the combined use of a truck and loader having a total $L_{eq, (15 \text{ min})}$ sound power level of 113 dBA.

We have created a computer model for this site to calculate the construction noise level at the nearest residence (800 m away) as scheduled in Table 7.1 below.

Table 7.1 Calculated $L_{eq, (15 \text{ min})}$ Noise Levels at Receptor Locations

Receptor Location	Acceptable Level	Calculated Level	Compliance
Location 'B' 180 Appin Road, Appin	52 dBA	43 dBA	Yes
Location 'C' 196 Appin Road, Appin	52 dBA	43 dBA	Yes

At a distance of approximately 800 m, the calculated sound pressure level at Location B and C due to the substation construction activities is well below the construction noise criterion of 52 dBA during construction hours and is therefore acceptable.

7.2 Construction Vehicles on Access Road

The calculated L_{eq} noise levels in Table 7.2 below are from a typical 25 Tonne truck excavator having a total $L_{eq, (15 \text{ min})}$ sound power level of 105 dBA. The model allows for 4 vehicles driving along the access road each hour.

Table 7.2 Calculated L_{eq} Noise Levels at Receptor Locations

Receptor Location	Acceptable Level	Calculated Level	Compliance
Location 'B' 180 Appin Road, Appin	52 dBA	38 dBA	Yes
Location 'C' 196 Appin Road, Appin	52 dBA	52 dBA	Yes

At a distance of approximately 100 metres to Location B and 23 metres to Location C, the calculated sound pressure level at the two receptor locations due to traffic along the access road complies with the construction noise criterion of 52 dBA during construction hours and is also acceptable.



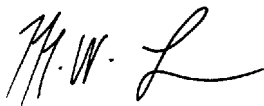
8.0 NOISE IMPACT STATEMENT

Measurements and computations show that, the level of noise emitted by the proposed construction works at the East Appin 66 kV Switching Station (north Appin) complies with the construction noise criteria at the nearest and most affected receptor locations.

Although noise control measures are not required for compliance with the construction noise criteria, we recommend the following basic administrative noise controls to reduce noise impacts:

- **Machinery Noise Level Checks** - Equipment should be well maintained to avoid unnecessary squeaks, rattles and exhaust noise. If the noise level of an item of equipment is suspected to be out of specification (Table 6.1) the noise level of the equipment should be measured as described in Section 6 and the necessary maintenance action taken.
- **Complaint Handling** – Nearby residents should be informed of the construction works via letter drops and the contact details of the site manager should be provided to residents. In the event of a noise complaint the site manager should immediately investigate the complaint.

We are of the opinion that sound emitted from this development will not cause “offensive noise” as defined by the Protection of the Environment Operations Act 1997.



Matthew Fishburn, BE(Mech) Hons, MAAS

Consulting Acoustical Engineer

for and on behalf of Day Design Pty Ltd.

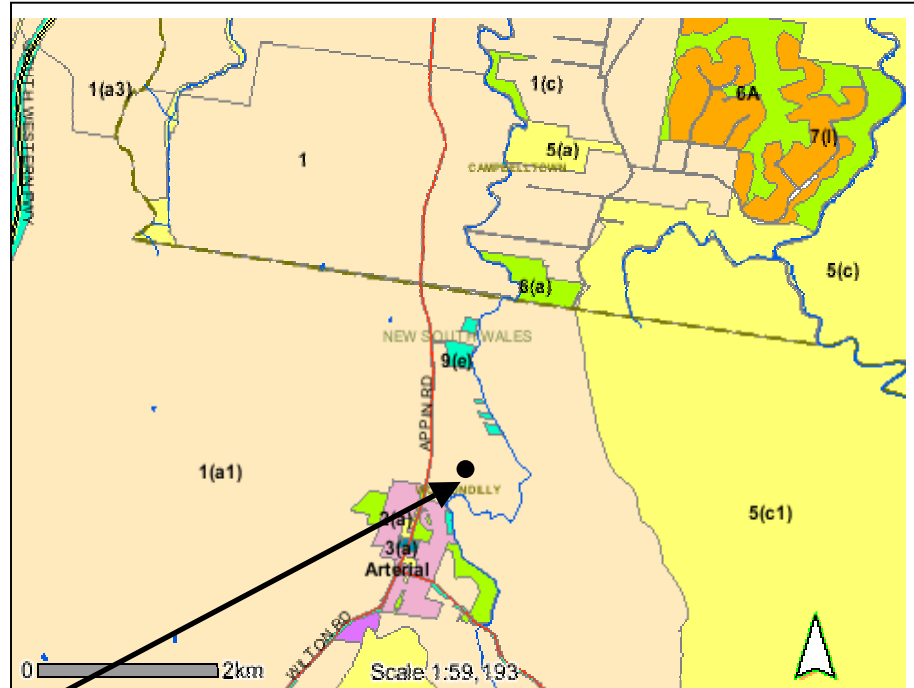
A.A.A.C. MEMBERSHIP

Day Design Pty Ltd is a member company of the Association of Australian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

Attachments:

- Figure 1 – Location Plan
- Figure 2 – Ambient Noise Survey
- Figure 3 – Site Plan



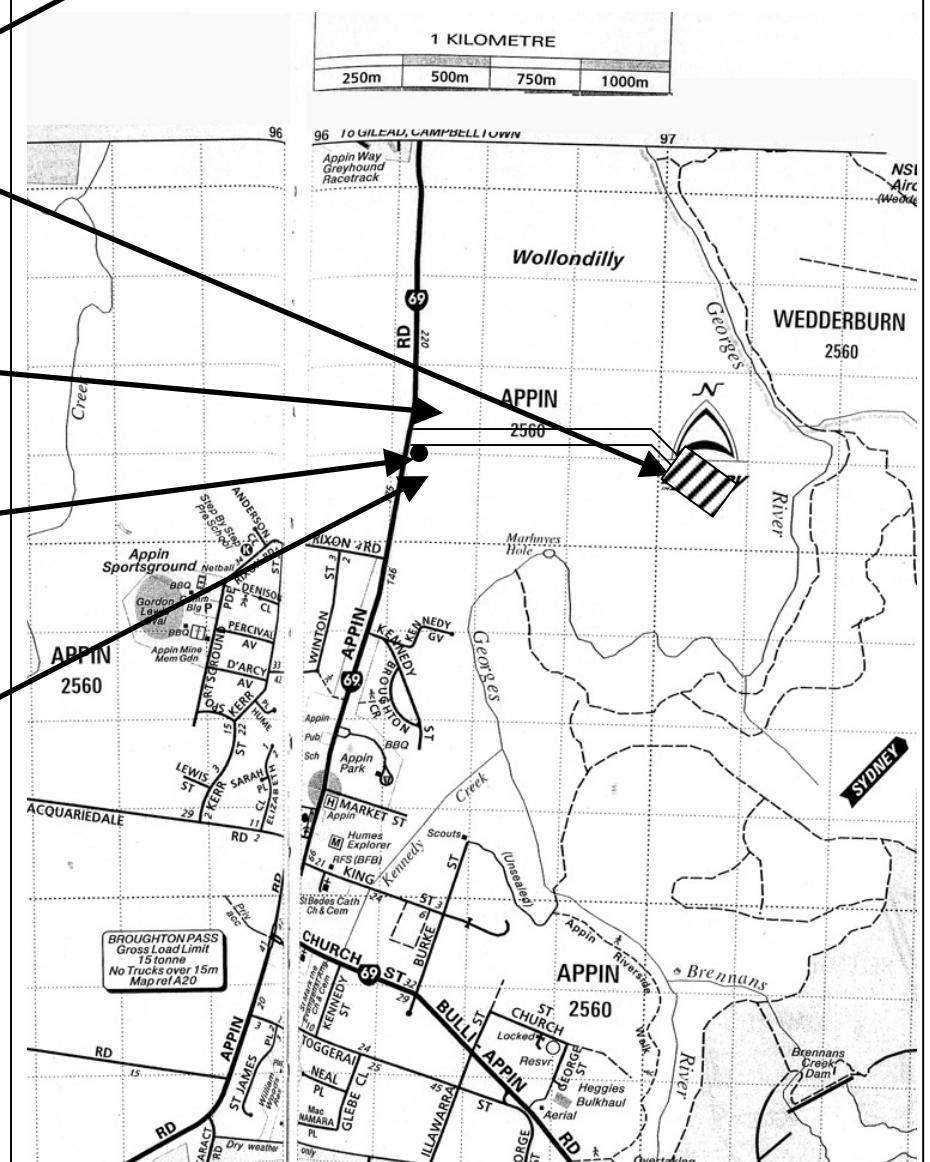


East Appin 66 kV
Switching Station

Location C:
196 Appin Road
Appin

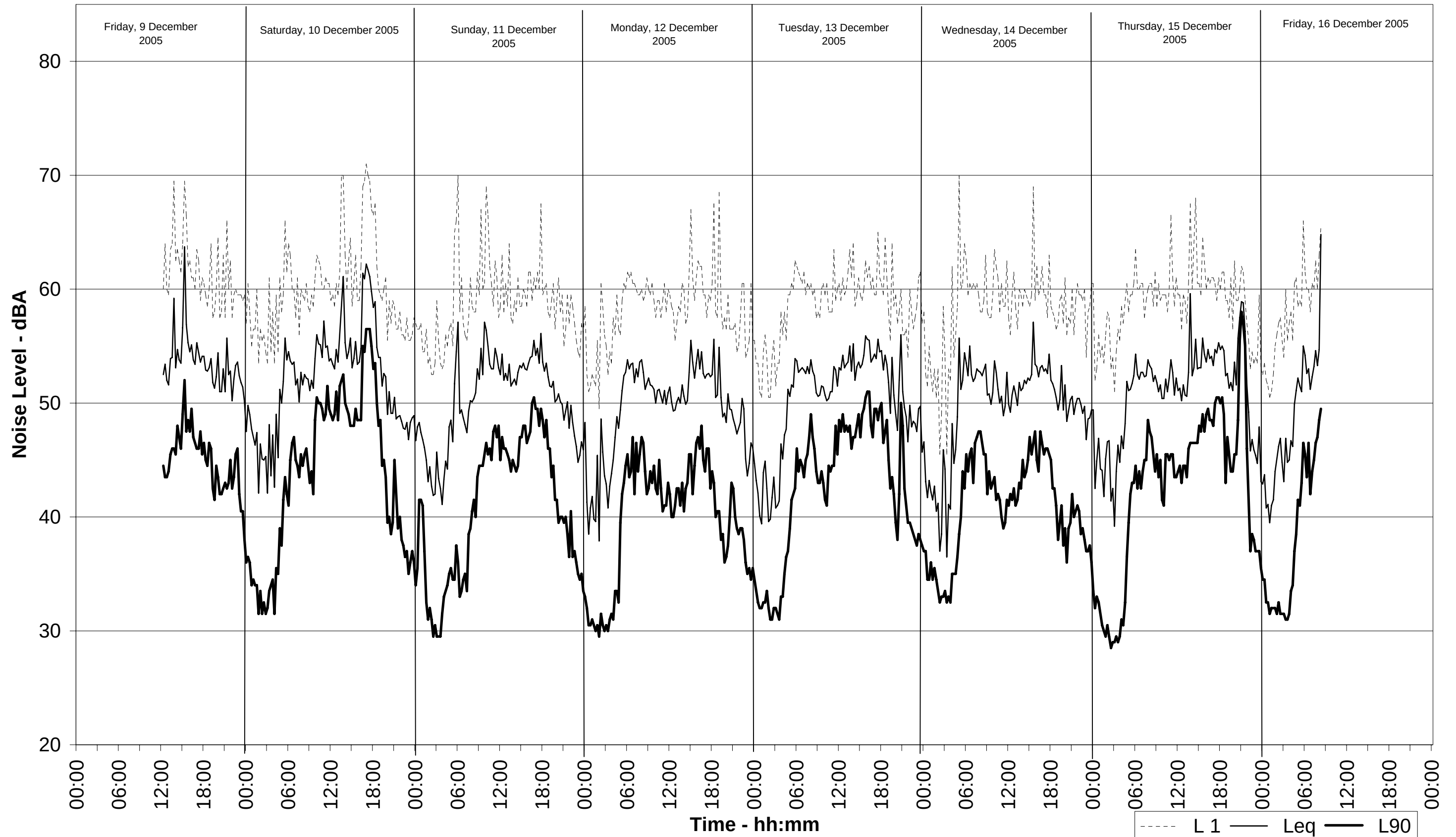
Logger Location A:

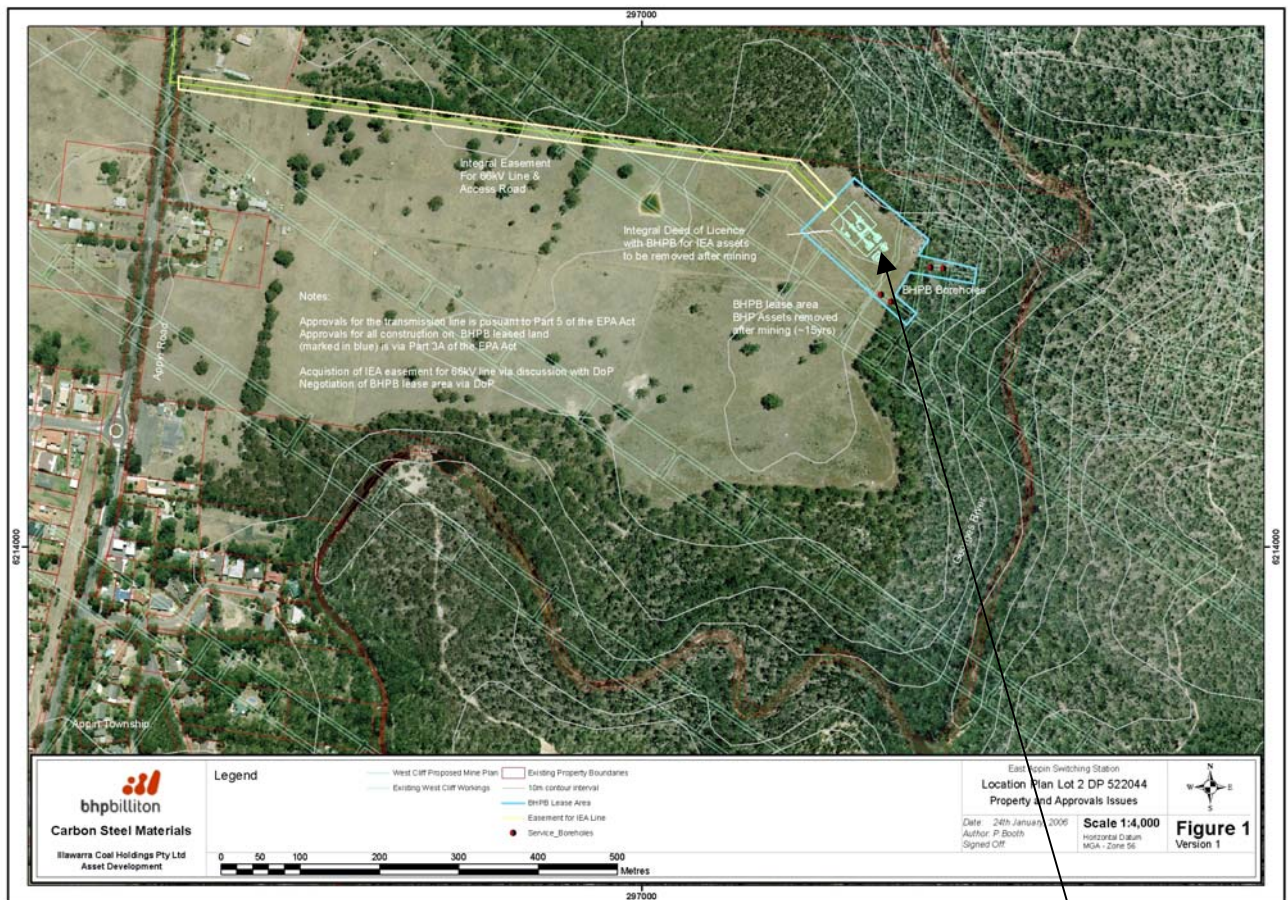
Location B:
180 Appin Road
Appin



Ambient Noise Survey

Located at 180 Appin Road, Appin, NSW





Proposed East Appin 66 kV
Switching Station

APPENDIX IV

Biosis Research Pty Limited

**Report titled Flora and Fauna Assessment: East Appin 66kV Switching Station”,
and dated January 2006,**



Flora and Fauna Assessment: East Appin 66kV Switching Station

January 2006

**Terri-Ann English
Sian Wilkins**

**Report for BHP Billiton
Illawarra Coal**

**Flora and Fauna Assessment:
East Appin 66kV Switching
Station**

January 2006

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Biosis Research Pty. Ltd. acknowledges the contribution of the following people and organisations in preparing this report:

- Robert Suansri (Biosis Research)
- Eleni Taylor-Wood (Biosis Research)
- David Olsen (Olsen Environmental Consultants)
- Patrick Booth (BHP Billiton)

ABBREVIATIONS

CAVs	Census of Australian Vertebrates
DEC	NSW Department of Environment and Conservation
DEH	Commonwealth Department of the Environment and Heritage
DNR	Department of Natural Resources
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
KTP	Key Threatening Process
LGA	Local Government Area
MNES	Matter of National Environmental Significance
NPWS	NSW National Parks and Wildlife Service (now DEC)
ROTAP	Rare or Threatened Australian Plant as listed by Briggs and Leigh
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	<i>Threatened Species Conservation Act 1995</i>
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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1.0 SUMMARY

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake a terrestrial flora and fauna assessment for the East Appin 66kV Switching Station and power line. The proposed works will enable power to be extracted from the main Integral Energy line north west of Appin to the West Cliff Mine. The substation will step the power down from 66kV to 11kV prior to it being transferred to the West Cliff underground workings via a cable located in a borehole.

The proposed Switching Station and power line are located approximate 2.0 km northeast of the Appin township and approximately 200 m west of Georges River within the Wollondilly Local Government Area (LGA, Figure 1). The proposed route for the power line runs from the east along a fence line west towards Appin Road (Figure 2).

The study area has been previously disturbed by agricultural practices and traverses cleared paddocks and areas of native vegetation, and is surrounded by similar landscapes to the north, south and west (Figure 2). To the east, the study area borders the Water Supply Reserve which links to the Dharawal State Conservation Area. The proposed works will involve clearing of vegetation and the construction of the Switching Station including fencing, cabling, access tracks and easement.

Three vegetation communities were identified in the study area: Western Sandstone Gully Forest, Shale Sandstone Transition Forest and Cleared Paddocks. Both Western Sandstone Gully Forest and Shale Sandstone Transition Forest were considered to be in good condition, with limited weed invasion, a high native species diversity and all structural layers intact. Cleared paddocks was considered to be in poor condition, with a high level of weed invasion, low native species diversity and all structural layers either modified or missing.

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community on both the TSC and EPBC Acts. The proposed works will not involve the removal of any areas of Shale Sandstone Transition Forest, with the exception of some possible branch removal and clearing of some characteristic trees of the community occurring as scattered trees in areas of Cleared Paddocks. The impact of the proposed works on this ecological community is therefore considered to be negligible and, as such, Assessments of Significance were not carried out for this community.

No threatened plant species were recorded in the study area, however, the native vegetation in the study area is potential habitat for two threatened plant species, *Grevillea parviflora* spp. *parviflora* and *Persoonia hirsuta*. *Grevillea parviflora* spp. *parviflora* is listed as Vulnerable on both the TSC and EPBC Acts while

Persoonia hirsuta is listed as Endangered on both Acts. Assessments of Significance under the TSC and EPBC Acts were carried out for *Grevillea parviflora* spp. *parviflora* and *Persoonia hirsuta* and found that the proposed works would not have a significant impact on these species.

Fauna habitat within the study area broadly corresponds to the plant communities and consists of Cleared Paddocks and Woodland. Twenty animal species were recorded utilising these habitats during the current survey including the Garden Skink *Lampropholis guichenoti*, White-throated Treecreeper *Cormobates leucophaeus* and Swamp Wallaby *Wallabia bicolor*. Six of the animals species recorded during the survey are introduced species (one bird and five mammal species).

No threatened fauna were recorded during the current survey. However, the study area contains potential habitat for ten animal species listed on the TSC Act and EPBC Act (Bush-stone Curlew *Burhinus grallarius*, Gang-gang Cockatoo *Callocephalon fimbriatum*, Glossy Black Cockatoo *Calyptorhynchus lathami*, Swift Parrot *Lathamus discolor*, Turquoise Parrot *Neophema pulchella*, Regent Honeyeater *Xanthomyza phrygia*, Eastern False Pipistrelle *Falsistrellus tasmaniensis*, Koala *Phascolarctos cinereus*, Brown Treecreeper *Climacteris picumnus victoriae* and Broad-headed Snake *Hoplocephalus bungaroides*). Habitat for these species occurs within the proposed Switching Station construction area along the eastern border of the study area, as well as in the adjacent Water Supply Reserve.

The proposed works are likely to modify 1.3 ha of the potential habitat for these animal species within the study area. Given the mobility of these species and the extent of potential habitat in the immediate vicinity of the study area (Water Supply Reserve), it is unlikely that the proposed works would have a significant impact on these species. The nature of the proposed works is such that it is considered highly unlikely that death or injury, or loss of limiting breeding or foraging resources for any threatened animal species will occur. Therefore Assessments of Significance under the TSC Act or the EPBC Act have not been prepared for these species.

A Species Impact Statement (TSC Act) or a Referral for Matters of National Significance (EPBC Act) is not considered necessary for any threatened flora or fauna within the study area for the proposed activities.

The proposed works are unlikely to have a significant impact on threatened species, endangered ecological communities or populations, however, it is recommended that the following points be taken into consideration to minimise any disturbances on the ecological values of the study area:

- where possible trees with hollows should be retained;

- appropriate sediment/erosion and drainage control devices should be utilised during and after excavation works in order to prevent sediment laden run off;
- any additional areas of native vegetation that may require clearing for access are not included in this impact assessment and should be assessed separately;
- care should be taken during construction to minimise disturbance to native vegetation and to avoid spreading exotic species propagules into the adjoining vegetation;
- any landscaping or rehabilitation works should use local native species; and,
- all weed control and rehabilitation works should be undertaken by suitably qualified and experienced people.

2.0 INTRODUCTION

2.1 Background

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake a terrestrial flora and fauna assessment for the East Appin 66kV Switching Station and power line. This report assesses the conservation significance of the study area in terms of threatened species, populations (and/or their habitats) and ecological communities that occur, or have the potential to occur in the study area in accordance with the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act), *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.1.1 Proposed Development Activity

The proposed East Appin 66kV Switching Station and power line will enable power to be extracted from the main Integral Energy line north west of Appin to the West Cliff Mine. The location of the proposed Switching Station is shown in Figure 1. The substation will step the power down from 66kV to 11kV prior to it being transferred to the West Cliff underground workings via a cable located in a borehole.

The proposed works will involve clearing of vegetation (approximately 1.3 ha) and the construction of the Switching Station including fencing, cabling, access tracks and easement.

2.1.2 Description and Features of the Study Area

The proposed Switching Station and power line are located approximate 2.0 km northeast of the Appin Township and approximately 200 m west of Georges River within the Wollondilly Local Government Area (LGA) (Figure 1). The proposed route for the power line runs from the east along a fence line west towards Appin Road (Figure 2).

The study area has been previously disturbed by agricultural practices and traverses cleared paddocks and areas of native vegetation, and is surrounded by similar landscapes to the north, south, and west (Figure 2). To the east, the study area occurs along the border of the Water Supply Reserve which links to the Dharawal State Conservation Area.

For the purpose of this report the Switching Station includes the construction of a building, associated facilities and boreholes (Figure 2). The powerline includes the construction of access tracks and powerline easement (Figure 2).

2.2 Aims

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the study area including the immediate surrounds and to determine the impact of the proposal on any matter of conservation significance.

The specific aims are to:

1. conduct a literature review and database search for the study area;
2. provide a brief assessment of the habitat values of the study area;
3. undertake targeted field surveys for threatened terrestrial species, populations (and/or their habitats) and ecological communities listed under the schedules of the TSC and/or EPBC Acts that are known or likely to occur within the study area;
4. undertake Section 5A Assessments of Significance for threatened species, populations and ecological communities listed on the TSC Act and/or Assessments of Significance for threatened and migratory species listed on the EPBC Act that are either directly or indirectly impacted by the proposal; and,
5. provide recommendations to minimise the environmental impacts of the proposed development.

3.0 METHODS

The study area was inspected on 10 January, 2006. The general condition of the study area was assessed and observations made of extant plant and animal species and vegetation communities as detailed below. During the site visit the weather was overcast with intermittent showers and a maximum temperature of 32⁰C.

3.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names where available have been included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by Department of Environment and Heritage (DEH). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

3.2 Literature and Database Review

A list of documents used to prepare this report is located in *References*. Records of threatened species, populations and communities were obtained from the Department of Environment and Conservation (DEC) Atlas of NSW Wildlife within a 10 km radius of the study area, using the Wollongong 1:100 000 map sheet. Records for threatened species, populations and communities listed on the EPBC Act were obtained from the Department of Environment and Heritage (DEH) EPBC Online Database within a 10 km radius of the study area. Database searches were conducted in November 2005.

3.3 Flora Survey

Species of plant growing in the study area were surveyed by undertaking a general habitat assessment as well as targeted searches for habitat of threatened species.

3.3.1 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- species composition (species richness, degree of weed invasion); and,
- vegetation structure (representation of each of the original layers of vegetation).

The three categories used to evaluate general habitat value were Good, Moderate or Poor, as detailed below:

Good: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact.

Moderate: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact.

Poor: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing.

3.4 Fauna Survey

Fauna species using the site were surveyed by undertaking active searching and listening, as well as recording incidental observations.

3.4.1 Fauna Habitat Assessment

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

Good: ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native animal species.

Moderate: ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native animal species.

Poor: ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native animal species.

Other habitat features, such the value of the study area as a habitat corridor, the presence of remnant communities or unusual ecological vegetation community structures, were also used to assess habitat quality.

3.5 Limitations

Some plant species that occur in the local area are annuals (completing their life cycle within a single season) and are present only in the seed bank for much of the year. Other plant species are perennial but are inconspicuous unless flowering. Similarly, some fauna may be seasonally absent from the study area.

This study was by design a habitat assessment and was conducted in accordance with the methodology employed for an assessment under Section 5A of the EP&A Act. Therefore no trapping, spotlighting, call playback or vegetation quadrat sampling techniques were used. As the assessment is based on presence or absence of suitable habitat for a threatened species, such techniques are not necessary as the habitat based approach is conservative in nature, requiring only the presence of habitat, not individual records, for a threatened species to be considered further. The methodology employed for this assessment is sufficient to determine if the proposed development would have a significant impact on any threatened terrestrial species, populations or ecological communities.

4.0 RESULTS

A list of the plant and animal species recorded during the survey are provided in Appendix 1 and Appendix 2 respectively.

4.1 Soil

The soil landscape is mapped at a 1:100,000 scale as Blacktown (map unit bt) over the majority of the study area, with Hawkesbury (map unit ha) in the vicinity of the Georges River (Hazelton *et al.* 1990).

Blacktown soil landscape is described as gently undulating rises on Wianamatta shale (Hazelton *et al.* 1990). Hawkesbury soil landscape is described as rugged, rolling to very steep hills on Hawkesbury Sandstone (Hazelton *et al.* 1990).

4.2 Plant Communities

4.2.1 Previous mapping

Part of the area traversed by the proposed Switching Station and power line has been mapped by NPWS (2002, Figure 3) as Shale Sandstone Transition Forest (High and Low Sandstone Influence subunits), with Western Sandstone Gully Forest mapped as occurring further downslope and to the east.

4.2.2 Current survey

Cleared Paddocks

Cleared Paddocks (Plate 1) was the dominant plant community in the study area, covering approximately 1.1 ha of the Switching Station construction area and the entire area proposed for the powerline. Cleared Paddocks was dominated by exotic pasture grass species such as *Axonopus affinis*, *Paspalum dilatatum*, *Pennisetum clandestinum* and *Setaria gracilis* and herbaceous weed species such as *Centaureum tenuiflorum*, *Gomphocarpus fruticosus*, *Plantago lanceolata*, *Senecio madagascariensis* and *Sida rhombifolia*. Scattered trees recorded in the cleared paddock areas included *Corymbia gummifera*, *Eucalyptus racemosa*, *E. paniculata*, *E. resinifera* and *E. punctata*. Some regeneration of native species was also evident in Cleared Paddocks, with species such as *Acacia binervata*, *Grevillea mucronulata*, *Melaleuca thymifolia*, *Microlaena stipoides* and *Themeda australis* recorded growing mainly at the base of the scattered native trees and near boundary fences adjoining the native vegetation.

Cleared Paddocks was being grazed by goats and horses at the time of the survey. This vegetation was considered to be in poor condition, with a high level of weed invasion, a low diversity of native species and all structural layers either highly modified or absent. Prior to clearing, this community was likely to have supported Shale Sandstone Transition Forest.

Western Sandstone Gully Forest

The eastern section of the study area, where the land slopes towards the Georges River, supports Western Sandstone Gully Forest (Plate 2, approximately 1.3 ha of the study area). This community extends further west than shown on the NPWS vegetation mapping, with all of the vegetation within the Switching Station area being Western Sandstone Gully forest, not Shale Sandstone Transition Forest as indicated on the previous mapping of the area by NPWS (Figure 3).

This vegetation community is dominated by canopy trees of *Corymbia gummifera*, *Eucalyptus piperita* and *E. racemosa*, with *Angophora costata* and *E. pilularis* occurring less frequently. The small tree and shrub layer supported *Acacia linifolia*, *A. longifolia*, *A. myrtifolia*, *A. ulicifolia*, *Allocasuarina littoralis*, *Banksia spinulosa*, *Ceratopetalum gummiferum*, *Grevillea mucronulata*, *Hakea sericea*, *Isopogon anemonifolius*, *Kunzea ambigua*, *Persoonia levis*, *Platysace linearifolia* and *Ricinocarpos pinifolius*. The understorey was dominated by native species such as *Actinotus helianthi*, *Anisopogon avenaceus*, *Aristida ramosa* var. *ramosa*, *Austrodanthonia tenuior*, *Cyathochaeta diandra*, *Hardenbergia violacea*, *Lepidosperma laterale*, *Lomandra filiformis* ssp. *coriacea*, *L. obliqua* and *Themeda australis*.

This vegetation community was considered to be in good condition, with no weed species recorded, high native species diversity and all structural layers intact. This area was fenced off from the adjacent paddocks.

Shale Sandstone Transition Forest

The area to the north of the study area on the ridgetop is a transitional area between the adjacent Western Sandstone Gully Forest (described above) and Shale Sandstone Transition Forest.

This transitional area supported similar species to those recorded in the adjacent Western Sandstone Gully Forest with some additional shale influenced species such as *Eucalyptus punctata* and *E. resinifera* present as dominants.

This community was considered to be in good condition, with no weed species recorded, a high native species diversity and all structural layers present. This area was also fenced off from adjacent paddocks.

4.3 Endangered Ecological Communities

Shale Sandstone Transition Forest is listed as an Endangered Ecological Community under the TSC and EPBC Acts. This community was recorded to the north of the study area, with scattered trees characteristic of this community also recorded in Cleared Paddocks within the study area.

4.4 Flora

Seventy nine vascular plant species were recorded from the study area, comprising 66 (84%) locally indigenous species and 13 (16%) exotic species. A list of plant species recorded is provided in Appendix 1.

4.4.1 Significant Flora

Fifteen threatened plant species listed on the TSC Act (Figure 4) and 13 threatened plant species from the EPBC Act and/or their habitat have been previously recorded within the local area (DEC Atlas of NSW Wildlife and DEH Online EPBC Database). A total of 15 threatened plant species are considered in this report (Table 1).

No threatened plant species were recorded within the study area, however, potential habitat for two threatened plant species was recorded, *Grevillea parviflora* spp. *parviflora* and *Persoonia hirsuta* (Table 1).

Table 1: Terrestrial flora listed on the TSC Act or EPBC Act that have the potential to occur in the local area

Species	Status			Habitat	Habitat present?
	EPBC Act ¹	TSC Act ²	ROTAP ³		
<i>Acacia bynoeana</i>	V	E1	3V	Sandstone ridgetop and Castlereagh Woodlands on sandy clay soil, often with ironstone gravels (NSW Scientific Committee 1999).	No. Sandstone ridgetops not recorded in study area.
<i>Caladenia tessellata</i>	V	E1	3V	Low open forest with heath or sometimes grass understorey – this species only grows in very dense shrubbery in coastal areas (Bishop 1996).	No. Study area not coastal.
<i>Cryptostylis hunteriana</i>	V	V	3V	This species typically grows in swamp-heath on sandy soils chiefly in coastal districts (Harden 1993) but has also been recorded on steep bare hillsides (Bishop 1996).	No. Swamp heath not recorded in study area.

Species	Status			Habitat	Habitat present?
	EPBC Act ¹	TSC Act ²	ROTAP ³		
<i>Cynanchum elegans</i>	E	E1	3Ei	Rainforest gullies scrub and scree slopes in Gloucester and Wollongong districts (Harden 1992).	No. Rainforest not recorded in study area.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	-	V	2K	Sclerophyll forest, scrub and swamps – from Gosford and Sydney districts (Harden 1992) specifically this species is thought to require wet heath vegetation (T. James pers. comm.).	No. Wet heath not recorded in study area.
<i>Grevillea parviflora</i> ssp. <i>parviflora</i>	V	V	-	Known to occur from Arcadia to North Maroota and in the Camden-Bargo-Appin area where it grows in sandy or light clay soils usually over thin shales in heath or shrubby woodlands (NSW Scientific Committee 1998a, Harden 2002).	Yes.
<i>Leucopogon exolasius</i>	V	V	2V	Woodland on sandstone, restricted to the Woronora and Grose Rivers (Harden 1991). More specifically this species is known to prefer rocky hillsides along creek banks (NPWS 1997).	No. Rocky hillsides along creek banks not recorded in study area.
<i>Melaleuca deanei</i>	V	V	3R	Wet heath on sandstone – coastal districts from Berowra to Nowra (Harden 2002).	No. Wet heath not recorded in study area.
<i>Persoonia bargoensis</i>	V	E1	2V	Woodland to dry sclerophyll forest on sandstone & laterite – restricted to the Bargo area, more specifically the species seems to prefer interfaces between shale derived soils and underlying sandstone (NPWS 2000b, Harden 2002).	No. Study area not in Bargo.
<i>Persoonia hirsuta</i>	E	E1	3Ki	Grows in woodland to dry sclerophyll forest on sandstone (Harden 2002) or rarely on shale (NSW Scientific Committee 1998b) from Gosford to Royal NP.	Possibly.
<i>Persoonia nutans</i>	E	E1	2Ei	Grows in Woodland to dry sclerophyll forest on laterite and alluvial sand on the Cumberland Plain (Robinson 1994, Harden 2002). It is restricted to Castlereagh Scribbly Gum Woodlands and in Agnes Banks Woodland (NPWS 2001).	No. Castlereagh Scribbly Gum Woodland or Castlereagh Woodland were not recorded in study area.
<i>Pomaderris brunnea</i>	V	V	2V	Open forest confined to the Colo River & upper Nepean River (Harden 1990), on clay & alluvial soils (Fairley and Moore 1995).	No. Study area not on Colo or upper Nepean Rivers.

Species	Status			Habitat	Habitat present?
	EPBC Act ¹	TSC Act ²	ROTAP ³		
<i>Pterostylis saxicola</i>	E	E1	-	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where <i>Pterostylis saxicola</i> occurs are either shale/sandstone transitions or shale communities (NSW Scientific Committee 1997).	No. Sandstone rock shelves above cliff lines were not recorded in study area.
<i>Pultenaea aristata</i>	V	V	2V	Moist sites in dry sclerophyll woodland to heath on sandstone – Helensburg to Mt Keira (Harden 2002). Preference for wet heath on sandstone rock platforms (T. James pers. comm.).	No. Wet heath not recorded in study area.
<i>Pultenaea pedunculata</i>	-	E1	-	Restricted to Wianamatta Shale on the Cumberland Plain and near Merimbula where it grows in dry sclerophyll forest and disturbed sites (Harden 2002). Specifically this species occurs on gravelly clay soils associated with remnants of the Cooks River Clay Plain Scrub Forest (James <i>et al.</i> 1999).	No. Cooks River Clay Plain Scrub Forest not recorded in study area.

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V)
 2) Listed on the TSC Act as Endangered (E1), or Vulnerable (V)
 3) ROTAP= Rare or Threatened Australian Plant (Briggs and Leigh 1995); for description of codes see Appendix 3

4.5 Fauna Habitats

Suitability, size and configuration of vertebrate fauna habitats broadly correlate with the structure, connectivity and quality of local and regional vegetation communities. Many local habitats are wholly, or in part, contiguous with much larger areas of bushland and therefore form part of a habitat corridor. At a broad scale, fauna habitat within the study area corresponds to the plant communities outlined in Section 4.2 and consists of Cleared Paddocks and Woodlands, these habitats are discussed in further detail below.

It is important to note that the habitat features within parts of the study area (as described for the vegetation communities, particularly Cleared Paddocks) have been substantially altered since the introduction of European agricultural practices.

4.5.1 General Habitat Descriptions

Cleared Paddocks

The study area largely occurs on farming land and is currently used for grazing. Most of the native vegetation has been previously cleared (Plate 1). Despite this some native species occur within disturbed vegetation and microhabitat components of Cleared Paddocks, but generally these areas provide few habitat opportunities for native fauna. Species more likely to inhabit these areas include introduced and domestic animals and natives tolerant of disturbance or favouring edge/ecotone habitat.

This habitat is considered to be in poor condition, with the ground flora containing a low number of indigenous species, vegetation community structure highly modified, ground log and litter layer disturbed and modified; few habitat and resource opportunities available for native fauna; and a low richness and diversity of native animal species.

Woodland

Woodland habitat occurs within the Switching Station and adjacent Water Supply Reserve and provides a wide range of foraging and sheltering habitats for vertebrate fauna (Figure 2 and Plate 2). Myrtaceaeous trees, mostly eucalypt species (*Eucalyptus piperita* and *E. racemosa*), dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) sources for a range of vertebrates, particularly birds and arboreal mammals. There are a few tree hollows (formed in stags, mature and/or senescent trees) within this habitat type that provide nesting and roosting habitat for hollow-dwelling fauna (eg. cockatoos & parrots, owls, gliders, possums and bats).

Understorey and shrub vegetation are dominated by native plant species and provide important potential habitat for a range of fauna. These include small birds (eg. fairywrens and robins) and ground-dwelling mammals (eg. Bushrat *Rattus fuscipes* and Antechinus sp.).

The ground cover consists of rock outcrops, scattered bark and fallen timber, all of which provide refuge and nesting habitat for a range of terrestrial animals. Many invertebrates and amphibians rely on these 'moisture-retaining' microhabitats to over-winter or as refuge during periods of drought. Similarly, many reptiles rely on ground litter and debris for shelter and foraging. Larger hollow logs provide potential denning and nesting habitat for small to medium sized mammals including the Common Wombat *Vombatus ursinus*.

The Woodland habitat is considered to be in moderate to good condition, with the ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer largely intact and undisturbed; and a large variety of habitat and resources for a range of native fauna available.

4.6 Fauna

A detailed fauna survey was not undertaken for this assessment. Incidental observations of fauna species utilising the study site are listed in Appendix 2 and include one reptile, thirteen birds (one introduced) and six mammals (five introduced).

4.6.1 Significant Fauna

A total of 35 threatened or migratory animal species or their habitat have been previously recorded within the local area (DEC Atlas of NSW Wildlife and DEH EPBC Online Database) (Table 2). Of these, 29 animal species are listed under the TSC Act and 19 animal species listed under the EPBC Act.

No threatened fauna were recorded during the current survey. However, the study area contains potential habitat for ten threatened species listed on the TSC Act and three threatened species listed on the EPBC Act (Table 2).

Table 2: Terrestrial fauna listed on the TSC Act or EPBC Act that may occur in the local area

Latin Name	Common Name	EPBC Act ¹	TSC Act ²	Habitat	Potential habitat
Amphibians					
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996, Recsei 1996). Can also occur within shale outcrops within sandstone formations. In the southern part of its range can occur in wet and dry forests, montane sclerophyll woodland and montane riparian woodland (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker <i>et al.</i> 1995).	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	V	E1	Found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes (NPWS 1999b). Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (White and Pyke 1996, NPWS 1999b).	No

Latin Name	Common Name	EPBC Act ¹	TSC Act ²	Habitat	Potential habitat
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	Occurs in wet and dry sclerophyll forests associated with sandstone outcrops between 280 and 1000 m on the eastern slopes of the Great Dividing Range (Barker <i>et al.</i> 1995). Prefers rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation (Barker <i>et al.</i> 1995). Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. It is not known from coastal habitats.	No
<i>Mixophyes balbus</i>	Stuttering Frog	V	E1	This species is usually associated with mountain streams, wet mountain forests and rainforests (Barker <i>et al.</i> 1995). It rarely wanders very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on the banks of streams and are washed into the water during heavy rains (Barker <i>et al.</i> 1995).	No
<i>Pseudophryne australis</i>	Red-crowned Toadlet	-	V	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. These creeks are characterised after rain by a series of shallow pools lined by dense grasses, ferns and low shrubs (Thumm and Mahony 1996, Thumm and Mahoney 1997).	No
Invertebrates					
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	-	E1	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge (NPWS 2000a).	No
Birds					
<i>Burhinus grallarius</i>	Bush Stone-curlew	-	E1	Lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present (Marchant and Higgins 1993).	Yes
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	-	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests (Higgins 1999). Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest (Forshaw and Cooper 1981). In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in bo-ironbark assemblages, or in dry forest in coastal areas (Shields and Crome 1992). It requires tree hollows in which to breed (Gibbons and Lindenmayer 1997).	Yes

Latin Name	Common Name	EPBC Act ¹	TSC Act ²	Habitat	Potential habitat
<i>Calyptrorhynchus lathamii</i>	Glossy Black-cockatoo	-	V	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types (NPWS 1999a) with a middle stratum of <i>Allocasuarina</i> below <i>Eucalyptus</i> or <i>Angophora</i> . Often confined to remnant patches in hills and gullies (Higgins 1999). Breed in hollows stumps or limbs, either living or dead (Higgins 1999).	Yes
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	-	V	Live in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present (Traill and Duncan 2000).	Yes
<i>Gallinago hardwickii</i>	Latham's Snipe	M	-	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey and Knight 1997).	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	M	-	A migratory species that is resident to Australia. Found in terrestrial and coastal wetlands; favoring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes (English and Predavec 2001).	No
<i>Hirundapus caudacutus</i>	White-throated Needletail	M	-	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges (Pizzey 1983).	No
<i>Lathamus discolor</i>	Swift Parrot	EM	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects (Forshaw and Cooper 1981). The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields and Crome 1992). This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey 1983).	Yes
<i>Monarcha melanopsis</i>	Black-faced Monarch	M	-	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey 1983).	No
<i>Neophema pulchella</i>	Turquoise Parrot	-	V	Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs (Morris 1980). Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies (Higgins 1999). Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies which are moist (Higgins 1999).	Yes

Latin Name	Common Name	EPBC Act ¹	TSC Act ²	Habitat	Potential habitat
<i>Ninox strenua</i>	Powerful Owl	-	V	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within Red Turpentine in tall open forests and Black She-oak within open forests (Debus and Chafer 1994). Large mature trees with hollows at least 0.5 m deep are required for nesting (Garnett 1992). Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials (Gibbons and Lindenmayer 1997). Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm (Gibbons and Lindenmayer 1997).	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	M	-	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey 1983).	No
<i>Rostratula australis</i>	Australian Painted Snipe	VM	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant & Higgins 1993).	No
<i>Rostratula benghalensis</i>	Painted Snipe	M	-	Found in the fringes of swamps, dams, sewage farms and marshy areas, generally with a cover of grasses, lignum or open timber (Pizzey and Knight 1997).	No
<i>Xanthomyza phrygia</i>	Regent Honeyeater	EM	E1	A semi-nomadic species occurring in temperate Eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forests associations and wet lowland coastal forests (Pizzey 1983, NPWS 1999c).	Yes
Mammals					
	Eastern Bent-wing Bat	-	V	This species uses a broad range of habitats including rainforest, wet and dry sclerophyll forest, paper bark forest and open woodland and grassland (Churchill 1998). The species is cave dweller (although some individuals occasionally roost in human constructed tunnels and buildings) (Strahan 1995, Churchill 1998).	No
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	-	V	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows, but can also construct its own nest (Turner and Ward 1995). Because of its small size it is able to utilise a range of hollow sizes including very small hollows (Gibbons and Lindenmayer 1997). Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5 month period (Ward 1990).	No

Latin Name	Common Name	EPBC Act ¹	TSC Act ²	Habitat	Potential habitat
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range (Hoye and Dwyer 1995). Can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 1998). This species roosts in caves and mines in groups of between 3 and 37 individuals (Churchill 1998).	No
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	E	V	Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman and Read 1992). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar and Belcher 1995).	No
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	-	V	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high (Churchill 1998). Two observations have been made of roosts in stem holes of living eucalypts (Phillips 1995). There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor (Menkhorst and Lumsden 1995). This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites (Menkhorst and Lumsden 1995).	Yes
<i>Isodon obesulus</i>	Southern Brown Bandicoot	E	E1	Prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time (Braithwaite 1995). A mosaic of post fire vegetation is important for this species (Maxwell <i>et al.</i> 1996).	No
<i>Myotis adversus</i>	Large-footed Myotis	-	V	Occurs in most habitat types as long as they are near permanent water bodies, including streams, lakes and reservoirs. Commonly roost in caves, but can also roost in tree hollows, under bridges and in mines (Richards 1995, Churchill 1998).	No
<i>Petaurus australis</i>	Yellow-bellied Glider	-	V	Restricted to tall native forests in regions of high rainfall. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types (NPWS 1999d).	No
<i>Petaurus norfolcensis</i>	Squirrel Glider	-	V	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range (Suckling 1995). Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias (Quin 1995). There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps (Gibbons and Lindenmayer 1997). Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked (Menkhorst <i>et al.</i> 1988).	No

Latin Name	Common Name	EPBC Act ¹	TSC Act ²	Habitat	Potential habitat
<i>Phascolarctos cinereus</i>	Koala	-	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall (Reed and Lunney 1990, Reed <i>et al.</i> 1990).	Yes
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy (Johnston 1995).	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, <i>Melaleuca</i> swamps and <i>Banksia</i> woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee and Ford 1999).	No
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	-	V	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m (Churchill 1998). In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat (Hoye and Richards 1995). This species roosts in hollow tree trunks and branches (Churchill 1998).	No
Reptiles					
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	V	E1	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitat they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996, Webb and Shine 1998).	Yes
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	-	v	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist (Wellington and Wells 1985). Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests (Cogger 1992).	No

Key: 1) Listed on the EPBC Act as Endangered (E) or Vulnerable (V) or covered under migratory provisions (M) on the EPBC Act

2) Listed on the TSC Act as Endangered (E1), Vulnerable (V)

4.6.2 Koala Habitat (SEPP 44)

This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas, ensuring a permanent free-living population over their present range and attempting to reverse the current trend of koala population decline.

SEPP 44 applies to land within Local Government Areas (including Wollondilly) listed in SEPP 44, Schedule 1 for which a development application has been

made (SEPP 44, Section 6) and Council is the determining authority. Under this policy the distinction is made between 'potential' and 'core' Koala habitat.

"Potential Koala habitat" means areas of native vegetation where the trees of the types listed in Schedule 2 of the Policy constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

"Core Koala habitat" means an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Eucalyptus punctata (Grey Gum) is the only listed Koala feed tree present in the study area. This species occurs along the ridgelines with a few scattered trees within the cleared paddocks and appears in densities less than 15%. As such the study area cannot be considered 'potential' Koala habitat. Furthermore, no Koalas, or indirect evidence of them, were observed during the current surveys. A SEPP 44 Assessment is not recommended

5.0 IMPACT ASSESSMENT

5.1 Threatened Species Conservation Act (1995)

The Assessment of Significance is a statutory mechanism under Section 5A of the EP&A Act, as amended by the *Threatened Species Conservation Amendment Act* 2002, for assessing whether a proposed development activity may have a significant impact on threatened species, populations and/or ecological communities and/or their habitats. The results of this test are used to determine if a Species Impact Statement (SIS) is required for each species potentially occurring within the study area.

When a threatened species known to occur within the vicinity of a study area is not recorded during a survey, the presence of potential habitat for this species is used to determine the need to undertake an Assessment of Significance. Where there is no potential habitat in the study area for a threatened species, there is unlikely to be any impact on these species and therefore Assessments of Significance are not required for these species.

Flora

The study area contains Shale Sandstone Transition Forest which is listed as an Endangered Ecological Community under the TSC Act. The proposal will not involve clearing of any areas of Shale Sandstone Transition Forest, with the possible exception of some branch removal and/or clearing of some characteristic trees of the community occurring as scattered trees within Cleared Paddocks. Consequently the impact of the proposal on the Shale Sandstone Transition Forest is negligible and, as such, an Assessment of Significance has not been prepared for this community.

No threatened plant species or populations were recorded within the study area. However, the study area contained potential habitat for two threatened plant species (*Grevillea parviflora* ssp. *parviflora* and *Persoonia hirsuta*) and further consideration must be given to the potential impact of the proposed development on these species. As such, Assessments of Significance have been prepared for these species (see Appendix 4). The Assessments of Significance found that the proposed works will not result in a significant impact on these species.

Fauna

No threatened fauna were recorded during the site visit. Where there is potential habitat (foraging or breeding resources) for a threatened species in the study area,

further consideration must be given to the potential impact of the proposed development on these species. The proposed development may significantly impact threatened species by causing any of the following situations to arise:

- death or injury of individuals;
- loss or disturbance of limiting foraging resources; and
- loss or disturbance of limiting breeding resources.

The study area contains potential habitat for ten threatened species listed on the TSC Act (Table 3). This habitat occurs within the Switching Station along the eastern boarder of the study area and in the adjacent Water Supply Reserve. The proposed works are likely to modify 1.3 ha of the potential habitat for these species within the study area. Given the mobility of these species and the extent of potential habitat in the immediate vicinity of the study area (Water Supply Reserve) it is unlikely that the proposed works would have a significant impact on these species. The nature of the proposed work, are such that it is considered highly unlikely that death or injury, or loss of limiting breeding or foraging resources for any threatened animal species. Therefore Assessments of Significance have not been prepared and a SIS is not recommended for any fauna as part of the proposed development.

Potential habitat for the remaining 19 threatened species recorded from the local area does not occur on this site or is not limiting, and therefore Assessments of Significance are not required for these species.

Table 3: Threatened species listed on the TSC Act with potential habitat within the study area

Latin Name	Common Name	TSC Act ²
Birds		
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V
<i>Calyptrorhynchus lathamii</i>	Glossy Black-cockatoo	V
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper	V
<i>Lathamus discolor</i>	Swift Parrot	E1
<i>Neophema pulchella</i>	Turquoise Parrot	V
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E1
Mammals		

Latin Name	Common Name	TSC Act ²
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V
<i>Phascolarctos cinereus</i>	Koala	V
Reptiles		
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1

Key: Endangered (E), Vulnerable (V)

5.2 Environment Protection and Biodiversity Conservation Act (1999)

5.2.1 Significance Guidelines

Under the EPBC Act, if the proposed development has the potential to have an adverse impact on a threatened species, population or ecological community listed on the Act, the proposal must be referred to the Federal Minister for the Environment for further consideration.

Flora

One Endangered Ecological Community listed on the EPBC Act was recorded within the study area, Shale Sandstone Transition Forest. The proposal will not involve clearing of any areas of Shale Sandstone Transition Forest, with the exception of some possible branch removal and/or removal of scattered trees characteristic of the community within Cleared Paddocks. The impact to this community is therefore considered to be negligible and, as such, an Assessment of Significance under the EPBC Act has not been undertaken for this community.

Thirteen threatened plant species listed on the EPBC Act or their habitats have been recorded within 10 km of the study area (DEH EPBC Online Database). None of these threatened plant species were recorded within the study area, however, potential habitat for two species was recorded (*Grevillea parviflora* ssp. *parviflora* and *Persoonia hirsuta*). Assessments of Significance under the EPBC Act have been undertaken for these species (see Appendix 5). The Assessments of Significance found that the proposed works will not result in a significant impact on these species.

Fauna

Potential habitat for three animal species (Swift Parrot, Regent Honeyeater and Broad-headed Snake) listed on the EPBC Act occurs within the Switching Station along the eastern boarder of the study area and in the adjacent Water Supply Reserve (Table 2). It is likely that these species may use areas and resources within in the local area on a temporary basis, however they are unlikely to be solely dependent on the resources within the study area, hence the proposed works are unlikely to impact upon an area of limiting habitat and therefore area is not considered to be critical habitat. Furthermore it is unlikely that the modification of approximately 1.3 ha of this potential habitat would:

- lead to a long-term decrease in the size of any populations;
- reduce the area of occupancy of any species;
- fragment an existing population into two or more populations;
- adversely affect habitat critical to the survival of any species;
- disrupt the breeding cycle of any populations;
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that any species is likely to decline;
- result in invasive species that are harmful to a critically endangered, endangered or vulnerable species becoming established in the endangered, critically endangered or vulnerable species' habitat; or,
- interfere with the recovery of any species.

Therefore Assessments of Significance have not been prepared for these species and a Referral is not recommended.

6.0 RECOMMENDATIONS

The proposed works are unlikely to have a significant impact on threatened species, endangered ecological communities or populations, however, it is recommended that the following points be taken into consideration to minimise any disturbances on the ecological values of the study area:

- where possible trees with hollows should be retained;
- appropriate sediment/erosion and drainage control devices should be utilised during and after excavation works in order to prevent sediment laden run off;
- any additional areas of native vegetation that may require clearing for access are not included in this impact assessment and should be assessed separately;
- care should be taken during construction to minimise disturbance to native vegetation and to avoid spreading exotic species propagules into the adjoining vegetation;
- any landscaping or rehabilitation works should use local native species; and,
- all weed control and rehabilitation works should be undertaken by suitably qualified and experienced people.

7.0 CONCLUSION

The study area traverses cleared paddocks and areas of native vegetation and is surrounded by similar landscapes to the north, south, and west (Figure 2). To the east, the study area borders the Water Supply Reserve which links to the Dharawal State Conservation Area. The proposed works will involve clearing of vegetation (approximately 1.3 ha) and the construction of the Switching Station including fencing, cabling, access tracks and easement.

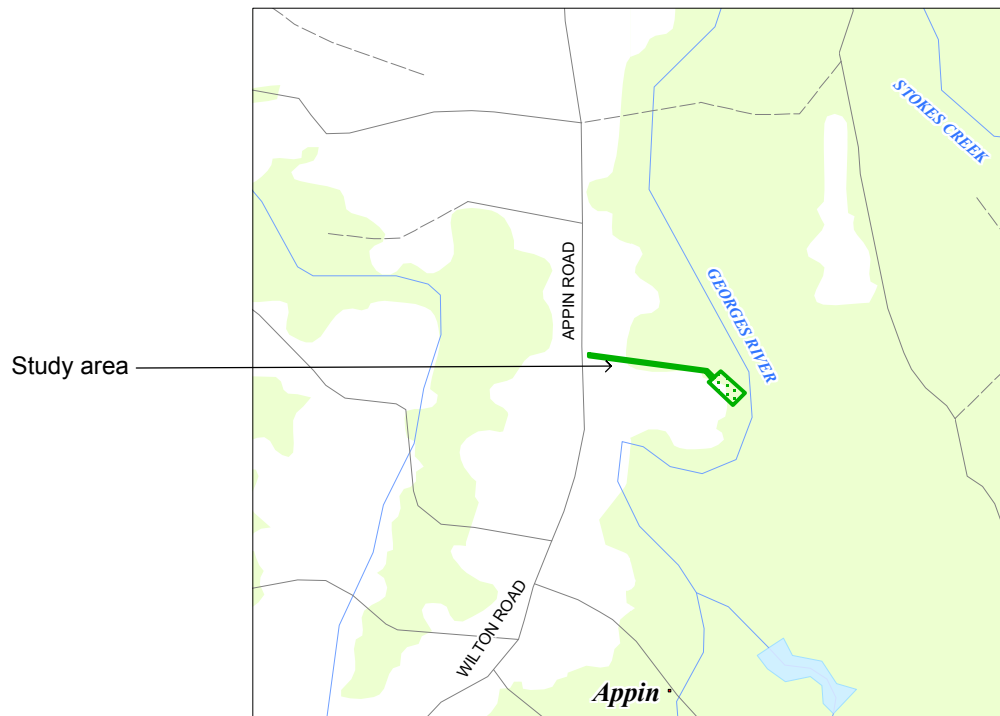
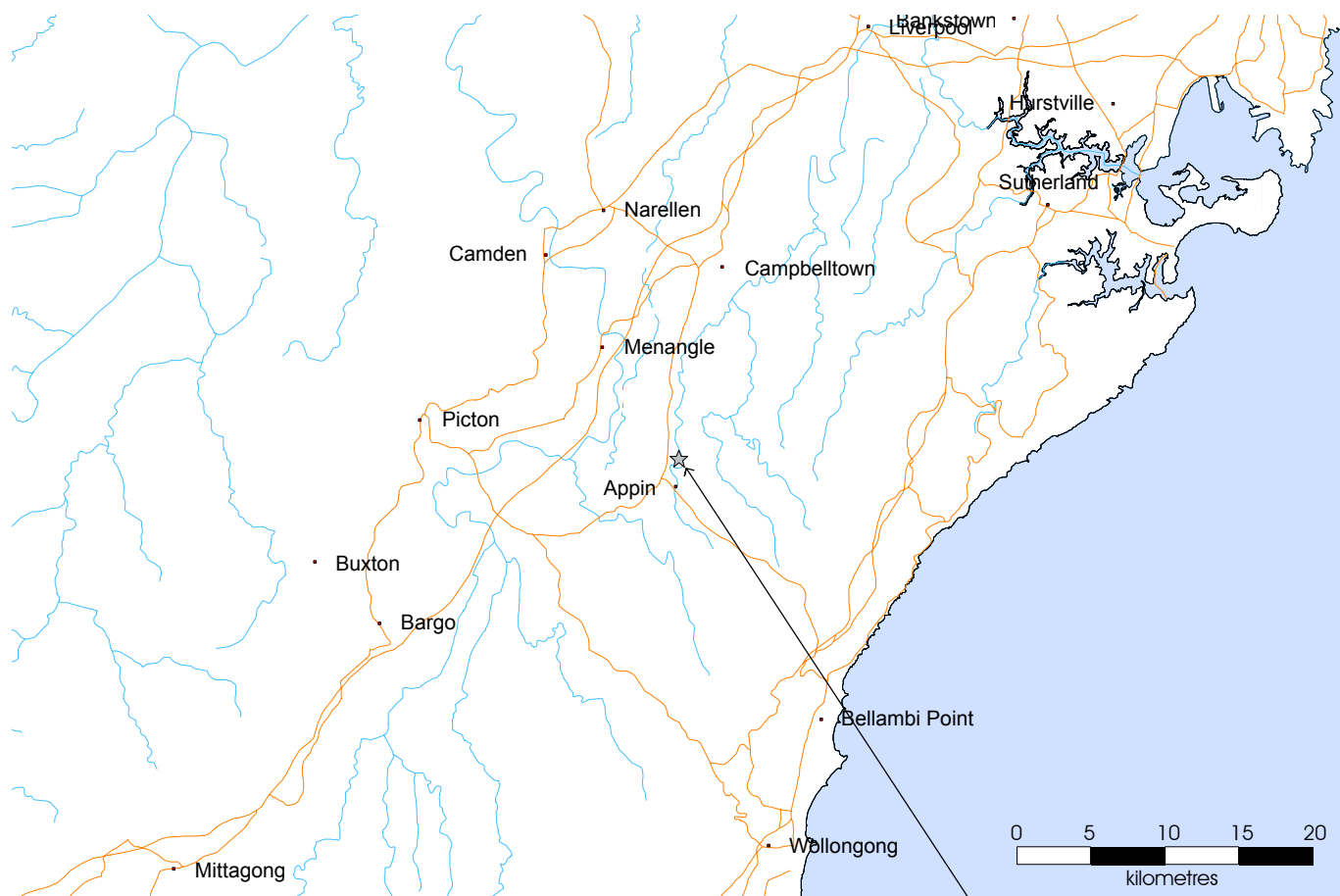
One Endangered Ecological Community was recorded to the north of the study area, Shale Sandstone Transition Forest. The proposed works will not involve clearing any areas of this community, with the possible exception of some branch removal and/or removal of some trees characteristic of the community occurring as scattered trees in Cleared Paddocks areas. Therefore, the potential impacts on this community are considered to be negligible and, as such, an Assessment of Significance has not been undertaken.

No threatened flora were recorded in the study area, however, potential habitat exists for two threatened plant species, *Grevillea parviflora* spp. *parviflora* and *Persoonia hirstua*. Assessments of Significance under the TSC and EPBC Acts carried out for these species found that the proposed works are unlikely to cause a significant impact.

No threatened fauna were recorded during the current survey. However, the study area contains potential habitat for ten threatened species listed on the TSC Act and three threatened species listed on the EPBC Act. This habitat occurs within the Switching Station along the eastern boarder of the study area and in the adjacent Water Supply Reserve. The proposed works are likely to modify 1.3ha of potential habitat for these species within the study area. Given the mobility of these species and the extent of potential habitat in the immediate vicinity of the study area (Water Supply Reserve) it is unlikely that the proposed works would have a significant impact on these species. The nature of the proposed works is such that it is considered highly unlikely that death or injury, or loss of limiting breeding or foraging resources for any threatened animal species will occur. Therefore Assessments of Significance under the TSC Act and the EPBC Act have not been prepared for these species.

A Species Impact Statement or a Referral for Matters of National Significance (EPBC Act) is not considered necessary for any threatened species or communities within the study area for the proposed development.

FIGURES



Acknowledgements: Geoscience Australia (1:250000 - SI/56-5).



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Figure 1: Location of the study area in a regional context.

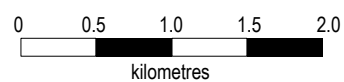
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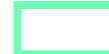
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Location:....\4000\4300s\4367\Mapping\4367 Fig 1.WOR

Scale:



-  Powerline easement
-  Proposed Development Boundary (based on new photograph)
-  Extent of area surveyed in current survey

Acknowledgements: BHP Billiton

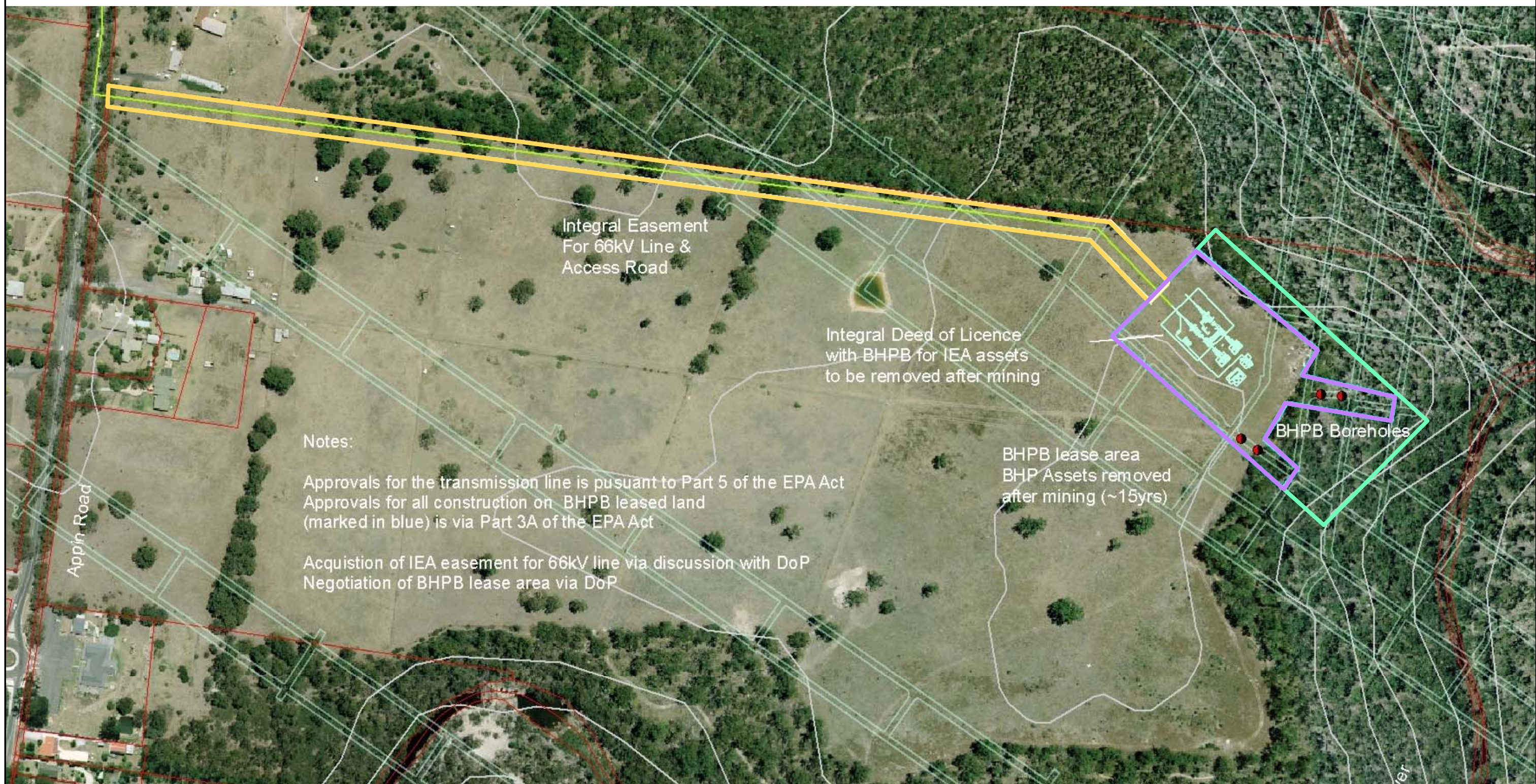


Figure 2: Proposed plan of the study area.

Figure 2: Proposed plan of the study area.

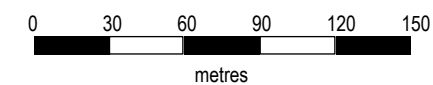
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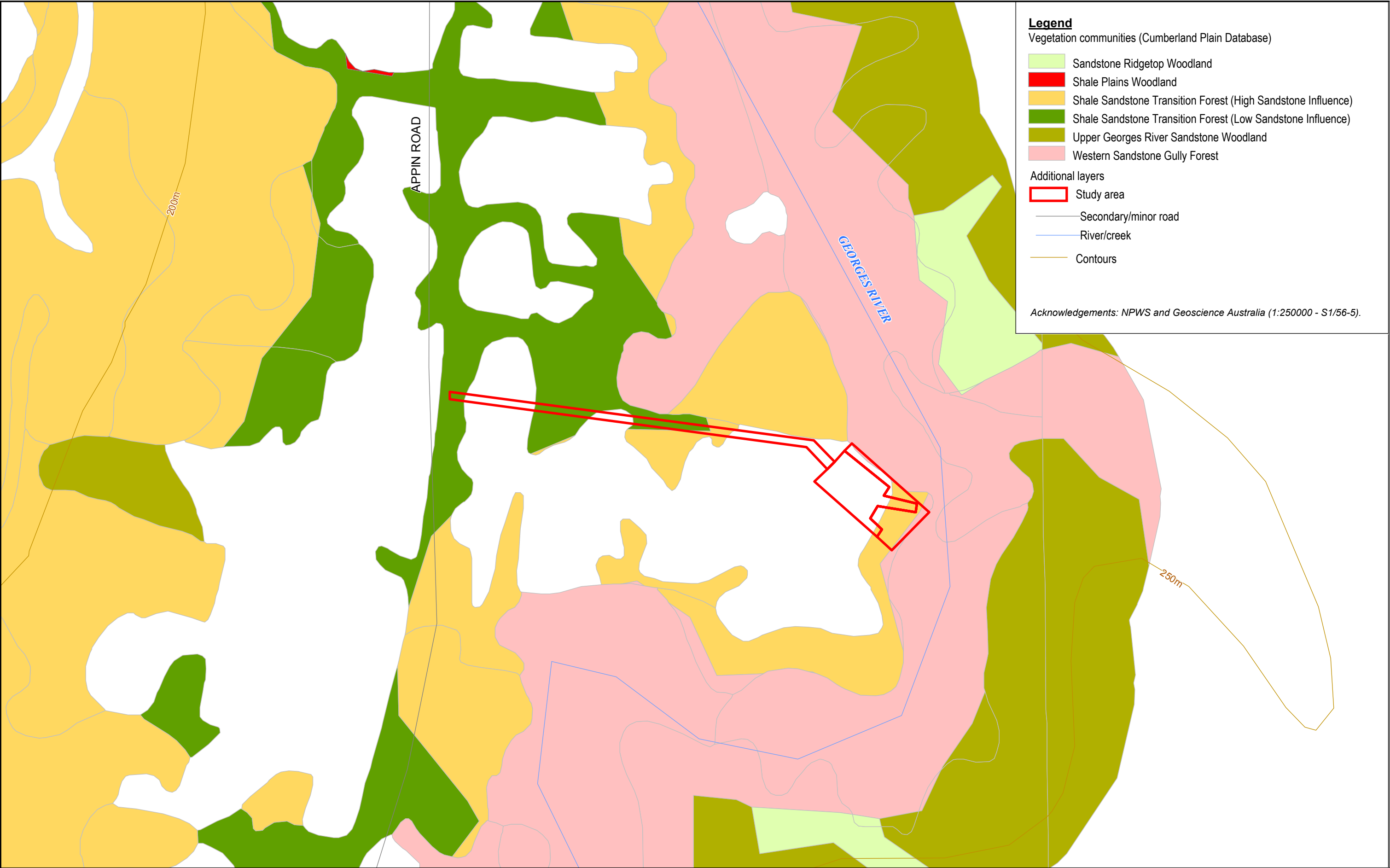
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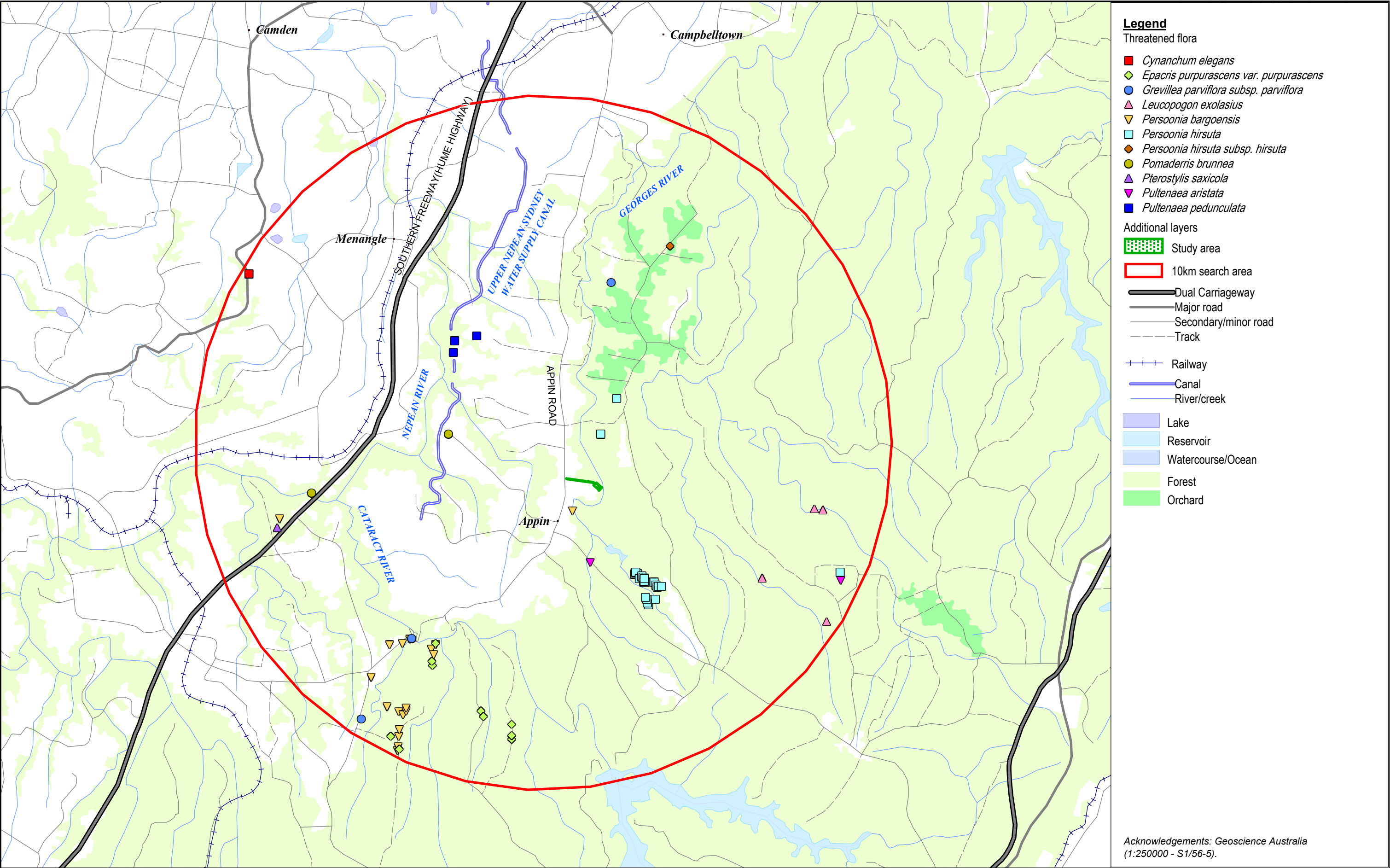
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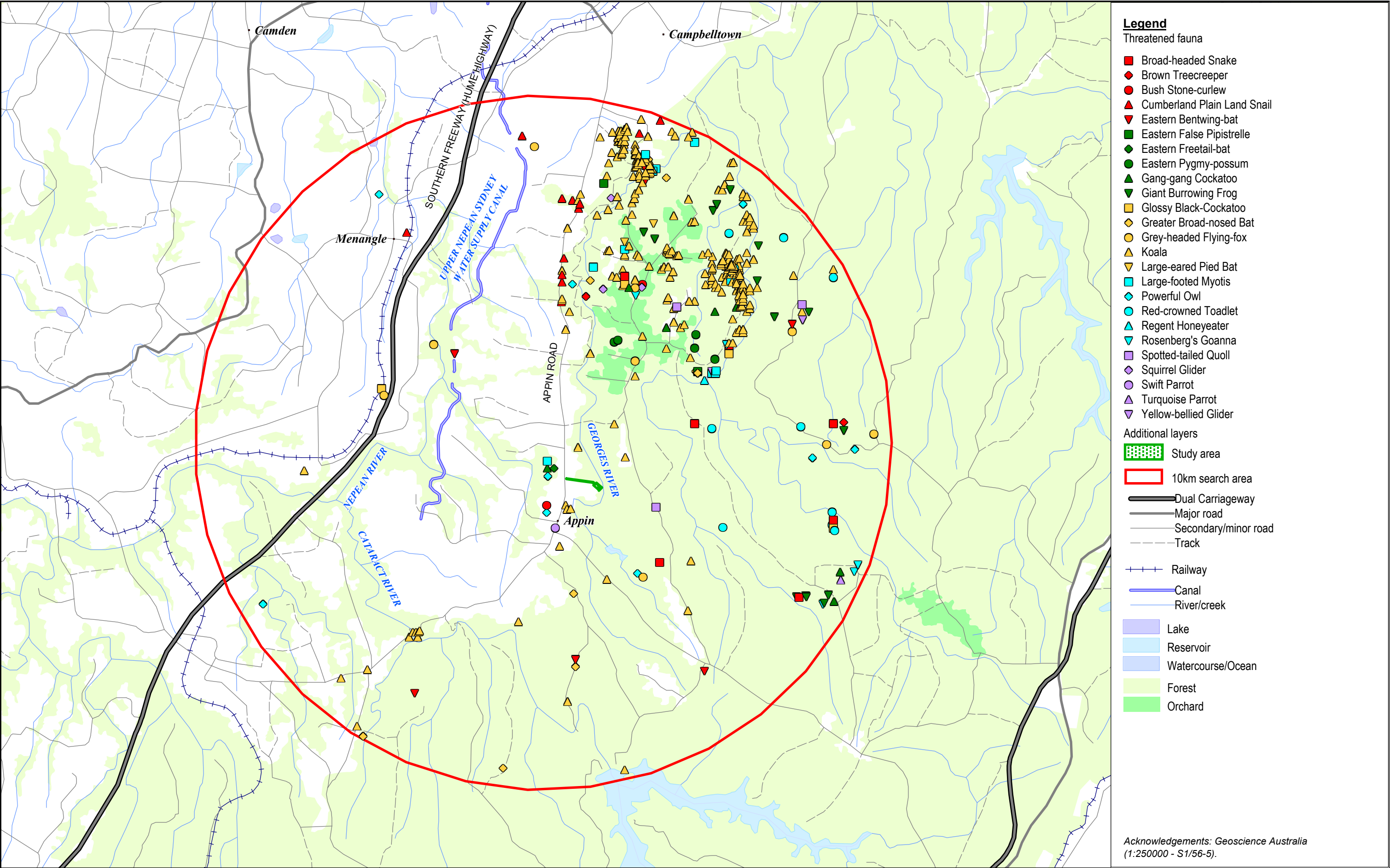


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PLATES



Plate 1: Cleared Paddocks



Plate 2: Western Sandstone Gully Forest

APPENDICES

APPENDIX 1

Flora Results

Family	Scientific name	Common name
Ferns and Fern-like Plants		
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Bracken
Monocotyledons		
Cyperaceae	<i>Cyathochaeta diandra</i>	Sheath Sedge
	<i>Lepidosperma laterale</i>	Variable Sword-sedge
Haemodoraceae	<i>Haemodorum</i> spp.	
Iridaceae	<i>Patersonia sericea</i>	Silky Purple-flag
Lomandraceae	<i>Lomandra filiformis</i> ssp. <i>coriacea</i>	Wattle Mat-rush
	<i>Lomandra filiformis</i> ssp. <i>filiformis</i>	Wattle Mat-rush
	<i>Lomandra obliqua</i>	
Phormiaceae	<i>Dianella caerulea</i> var. <i>caerulea</i>	Paroo Lily
Poaceae	<i>Anisopogon avenaceus</i>	Oat Speargrass
	<i>Aristida ramosa</i> var. <i>ramosa</i>	
	<i>Austrodanthonia tenuior</i>	Purplish Wallaby-grass
	* <i>Axonopus affinis</i>	Narrow-leaved Carpet Grass
	* <i>Briza maxima</i>	Quaking Grass
	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass
	<i>Entolasia stricta</i>	Wiry Panic
	<i>Eragrostis brownii</i>	Brown's Lovegrass
	<i>Imperata cylindrica</i> var. <i>major</i>	Blady Grass
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
	* <i>Paspalum dilatatum</i>	Paspalum
	* <i>Pennisetum clandestinum</i>	Kikuyu Grass
	* <i>Setaria gracilis</i>	Slender Pigeon Grass
	* <i>Sporobolus indicus</i> var. <i>capensis</i>	Parramatta Grass
	<i>Themeda australis</i>	Kangaroo Grass
Xanthorrhoeaceae	<i>Xanthorrhoea</i> spp.	
Dicotyledons		
Apiaceae	<i>Actinotus helianthi</i>	Flannel Flower
	<i>Platysace linearifolia</i>	
	<i>Xanthosia pilosa</i>	Woolly Xanthosia
Asclepiadaceae	* <i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush
Asteraceae	* <i>Conyza albida</i>	Tall Fleabane
	<i>Gnaphalium</i> spp.	
	* <i>Hypochaeris radicata</i>	Catsear
	* <i>Senecio madagascariensis</i>	Fireweed
Casuarinaceae	<i>Allocasuarina littoralis</i>	Black Sheoak
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush
Cunoniaceae	<i>Ceratopetalum gummiferum</i>	Christmas Bush
Euphorbiaceae	<i>Phyllanthus hirtellus</i>	Thyme Spurge
	<i>Poranthera microphylla</i>	Small Poranthera
	<i>Ricinocarpos pinifolius</i>	Wedding Bush
Fabaceae (Mimosoideae)	<i>Acacia binervata</i>	Two-veined Hickory
	<i>Acacia linifolia</i>	Flax-leaved Wattle
	<i>Acacia longifolia</i>	Coast/Sallow Wattle
	<i>Acacia myrtifolia</i>	Red-stemmed Wattle

Family		Scientific name	Common name
		<i>Acacia parramattensis</i>	Parramatta Wattle
		<i>Acacia suaveolens</i>	Sweet Wattle
		<i>Acacia terminalis</i>	Sunshine Wattle
		<i>Acacia ulicifolia</i>	Prickly Moses
Fabaceae (Faboideae)		<i>Bossiaea heterophylla</i>	Variable Bossiaea
		<i>Hardenbergia violacea</i>	False Sarsaparilla
Gentianaceae	*	<i>Centaurium tenuiflorum</i>	Slender Centaury
Goodeniaceae		<i>Goodenia hederacea</i> ssp. <i>hederacea</i>	Ivy Goodenia
		<i>Scaevola ramosissima</i>	Hairy Fan-flower
Malvaceae	*	<i>Sida rhombifolia</i>	Paddy's Lucerne
Myrtaceae		<i>Angophora costata</i>	Sydney Red/Rusty Gum
		<i>Callistemon pinifolius</i>	Pine-leaved Bottlebrush
		<i>Corymbia gummifera</i>	Red Bloodwood
		<i>Eucalyptus paniculata</i>	
		<i>Eucalyptus pilularis</i>	Blackbutt
		<i>Eucalyptus piperita</i>	Sydney Peppermint
		<i>Eucalyptus punctata</i>	Grey Gum
		<i>Eucalyptus racemosa</i>	Narrow-leaved Scribbly Gum
		<i>Eucalyptus resinifera</i>	
		<i>Kunzea ambigua</i>	Tick Bush
		<i>Melaleuca thymifolia</i>	
Plantaginaceae	*	<i>Plantago lanceolata</i>	Lamb's Tongues
Proteaceae		<i>Banksia serrata</i>	Saw Banksia
		<i>Banksia spinulosa</i> var. <i>spinulosa</i>	
		<i>Conospermum longifolium</i> ssp. <i>angustifolium</i>	
		<i>Grevillea mucronulata</i>	
		<i>Grevillea sericea</i>	
		<i>Hakea sericea</i>	Bushy Needlewood
		<i>Isopogon anemonifolius</i>	
		<i>Lomatia silaifolia</i>	Crinkle Bush
		<i>Persoonia levis</i>	Broad-leaved Geebung
		<i>Persoonia pinifolia</i>	Pine-leaved Geebung
Rubiaceae		<i>Pomax umbellata</i>	Pomax
Rutaceae		<i>Eriostemon australasius</i>	
Sapindaceae		<i>Dodonaea triquetra</i>	Large-leaf Hop-bush
Thymelaeaceae		<i>Pimelea linifolia</i> ssp. <i>linifolia</i>	Slender Rice-flower

APPENDIX 2

Fauna Results

Terrestrial fauna recorded in study site

Scientific Name	Common Name	Observation Type
Reptile		
<i>Lampropholis guichenoti</i>	Garden Skink	O
Birds -Native		
<i>Strepera graculina</i>	Pied Currawong	O/H
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	O/H
<i>Cormobates leucophaeus</i>	White-throated Treecreeper	H
<i>Macropygia amboinensis</i>	Brown Cuckoo-dove	H
<i>Rhipidura fuliginosa</i>	Grey Fantail	O/H
<i>Hirundo neoxena</i>	Welcome Swallow	O
<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	H
<i>Manorina melanocephala</i>	Noisy Miner	O
<i>Eopsaltria australis</i>	Eastern Yellow Robin	O
<i>Phalacrocorax varius</i>	Pied Cormorant	O
<i>Platycercus elegans</i>	Crimson Rosella	O
<i>Platycercus eximius</i>	Eastern Rosella	O
Birds-introduced		
<i>Acridotheres tristis</i>	Common Myna	O
Mammals-native		
<i>Wallabia bicolor</i>	Swamp Wallaby	I
Mammals-introduced		
<i>Capra hircus</i>	Goat (feral)	O
<i>Canis familiaris</i>	Dingo and Dog (feral)	O
<i>Vulpes vulpes</i>	Fox	I
<i>Equus caballus</i>	Horse (feral)	O
<i>Oryctolagus cuniculus</i>	Rabbit	O

Key: O=observed, H=Heard, I= Indirect evidence (scats, tracks, marks....)

APPENDIX 3

Conservation Rating According to Briggs and Leigh (1995)

Conservation Rating According to Briggs and Leigh (1996)

Briggs and Leigh (1996) list over 5,031 species, subspecies and varieties of plants (5% of native vascular flora of Australia) that have been ranked according to their conservation status. While many of these species are contained within the schedules of various state and federal threatened species legislation (eg. TSC Act and *EPBC* Act), and are subject to legislative provisions under those acts, a great many more do not and as a such are extraneous to statutory assessment processes.

The modified list below presents the range of codes that are, in various combinations, applied to each listed plant species.

- **1** Species only known from one collection
- **2** Species with a geographic range of less than 100km in Australia
- **3** Species with a geographic range of more than 100km in Australia
- **X** Species presumed extinct; no new collections for at least 50 years
- **E** Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate
- **V** Vulnerable species at risk of long-term disappearance through continued depletion.
- **R** Rare, but not currently considered to be endangered.
- **K** Poorly known species that are suspected to be threatened.
- **C** Known to be represented within a conserved area.
- **a** At least 1,000 plants are known to occur within a conservation reserve(s).
- **i** Less than 1,000 plants are known to occur within a conservation reserve(s).
- **-** The reserved population size is unknown.
- **t** The total known population is reserved.
- **+** The species has a natural occurrence overseas.

APPENDIX 4

EP&A Act Assessments of Significance

Flora

Grevillea parviflora* ssp. *parviflora

Grevillea parviflora ssp. *parviflora* is listed as Vulnerable on Schedule 2 of the TSC Act. This species is also listed as Vulnerable on the EPBC Act.

Grevillea parviflora subsp. *parviflora* is a low open to erect shrub, 0.3-1 m tall. It occurs in light clayey soils in woodlands and most plants appear capable of suckering from a rootstock (NSW Scientific Committee 1998a).

Approximately 1.3 ha of potential habitat for *Grevillea parviflora* ssp. *parviflora* was recorded in the area of the proposed Switching Station. This area will be disturbed by the construction of two boreholes and an associated access track. It is unlikely that the entire area will require clearing for the proposed works, but, for the purpose of the impact assessment, the worst case scenario will be assumed, i.e. removal of all of the vegetation within the Switching Station area in the study area.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

There were three recordings of *Grevillea parviflora* ssp. *parviflora* within 10 km of the study area (Figure 4). *Grevillea parviflora* ssp. *parviflora* was not recorded within the study area, however potential habitat does exist.

The proposed works will modify a maximum of 1.3 ha of potential habitat for the species in the study area. Since no individuals were recorded in the study area, it is unlikely that a viable population of the species will be placed at risk of extinction due to the proposed works.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

NA.

(c) in the case of an endangered ecological community of critically endangered ecological community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

NA.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

The potential habitat for *Grevillea parviflora* spp. *parviflora* occurs within Western Sandstone Gully Forest and Shale Sandstone Transition Forest in the study area. NPWS (2002, 2003) have mapped a total of 6,024 ha of these communities within a 10 km radius of the study area.

There is approximately 1.3 ha of potential habitat in the study area that will potentially impacted by the proposed works. The area of potential habitat for *Grevillea parviflora* ssp. *parviflora* that will be removed as part of the proposed development equates to 0.02 % of the extent of similar vegetation types in the locality (10 km radius of the study area).

The patch of vegetation that is potential habitat for *Grevillea parviflora* ssp. *parviflora* within the study area adjoins a larger area of vegetation that is part of Dharawal State Conservation Area. The area potentially disturbed as part of the proposed works is on the edge of this area of native vegetation, adjoining a cleared paddock. The removal or modification of this patch would not result in the isolation of any areas of potential habitat.

Given the size of the potential habitat to be disturbed, the large area of adjoining similar vegetation and the fact that no individuals were recorded during the current survey, the vegetation to be disturbed as part of the proposed development is not considered to be vital for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Grevillea parviflora* ssp. *parviflora*.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan or threat abatement plan has been written for *Grevillea parviflora* ssp. *parviflora*.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is listed as a Key Threatening Process. The proposal will involve the clearing of approximately 1.3 ha of vegetation that is potential habitat for *Grevillea parviflora* ssp. *parviflora*.

Conclusion:

Grevillea parviflora ssp. *parviflora* is known to occur within 10 km of the study area; however, it was not recorded during the field surveys for this assessment. Potential habitat for this species that will be removed or modified by the proposed development represents a relatively small area (0.02% of similar vegetation in the locality). For these reasons it is considered unlikely that the proposed development would have a significant impact on this species. A Species Impact Statement is not recommended.

Persoonia hirsuta

Persoonia hirsuta is listed as Endangered on Schedule 1 of the TSC Act. This species is also listed as Endangered on the EPBC Act and has been given a ROTAP conservation rating of 3Ki (Briggs and Leigh 1996).

Persoonia hirsuta is a spreading to decumbant shrub with moderate to densely hairy young branchlets. It occurs in woodlands and dry sclerophyll forest on sandstone or very rarely on shale (NSW Scientific Committee 1998b).

Approximately 1.3 ha of potential habitat for *Persoonia hirsuta* was recorded in the area of the proposed Switching Station. This area will be disturbed by the construction of two boreholes and an associated access track. It is unlikely that this entire area require clearing for the proposed works, but, for the purpose of the impact assessment, worst case scenario will be assumed, i.e. removal of all of the vegetation in the Switching Station construction area.

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

There were a number of recordings of *Persoonia hirsuta* within 10 km of the study area (Figure 4). *Persoonia hirsuta* was not recorded, however potential habitat for the species does exist in the study area.

The proposed works will modify a maximum of 1.3 ha of potential habitat for the species in the study area. Since no individuals were recorded in the study area, it is unlikely that a viable population of the species will be placed at risk of extinction due to the proposed works.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

NA.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

NA.

(d) in relation to the habitat of a threatened species, population or ecological community:

- (i) the extent to which the habitat is likely to be removed or modified as a result of the action proposed, and**
- (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**

The potential habitat for *Persoonia hirsuta* occurs within Western Sandstone Gully Forest and Shale Sandstone Transition Forest in the study area. NPWS (2002, 2003) have mapped at least 6,024 ha of these communities within a 10 km radius of the study area (the entire 10 km radius area has not been mapped to date).

There is approximately 1.3 ha of potential habitat in the study area that will potentially impacted by the proposed works. The area of potential habitat for *Persoonia hirsuta* that will be removed as part of the proposed development equates to 0.02% of the extent of similar vegetation in the locality (10 km radius of the study area).

The patch of vegetation that is potential habitat for *Persoonia hirsuta* within the study area adjoins a larger area of vegetation that is part of Dharawal State Conservation Area. The area potentially disturbed as part of the proposed works is on the edge of this area of native vegetation, adjoining a cleared paddock. The removal or modification of this patch would not result in the isolation of any areas of potential habitat.

Given the size of the potential habitat to be disturbed, the large area of adjoining similar vegetation and the fact that no individuals were recorded during the current survey, the vegetation to be disturbed as part of the proposed development is not considered to be vital for the long term survival of the species in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for *Persoonia hirsuta*.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

To date, no recovery plan or threat abatement plan has been written for *Persoonia hirsuta*.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Clearing of native vegetation is listed as a Key Threatening Process. The proposal will involve the clearing a maximum of approximately 1.3 ha of vegetation that is potential habitat for *Persoonia hirsuta*.

Conclusion:

Persoonia hirsuta is known to occur within 10 km of the study area; however, it was not recorded during the field surveys for this assessment. Potential habitat for this species that will be removed or modified by the proposed development represents a relatively small area. For these reasons it is considered unlikely that the proposed development would have a significant impact on this species. A Species Impact Statement is not recommended.

APPENDIX 5

EPBC Assessment of Significance

Critically Endangered or Endangered Species

Potential habitat occurs within the study site for one Endangered plant species listed on the EPBC Act: *Persoonia hirsuta*.

This species was not recorded within the study site during the current survey.

Persoonia hirsuta

Is the action likely to lead to a long-term decrease in the size of a population of a species?

Persoonia hirsuta was not recorded in the study area. The study area does not support a population of the species. The proposal is therefore unlikely to lead to a long-term decrease in the size of a population of the species.

Is the action likely to reduce the area of occupancy of the species?

Persoonia hirsuta was not recorded in the study area. The removal or modification of a maximum of 1.3 ha of vegetation that is potential habitat for *Persoonia hirsuta* is not likely to reduce the area of occupancy of the species.

Is the action likely to fragment an existing population into two or more populations?

No populations of *Persoonia hirsuta* were recorded in the study area. The patch of vegetation that is potential habitat for *Persoonia hirsuta* within the study area adjoins a larger area of vegetation that is part of Dharawal State Conservation Area. The area potentially disturbed as part of the proposed works is on the edge of this area of native vegetation, adjoining a cleared paddock. The removal or modification of this patch would not result in the isolation of any areas of potential habitat.

Is the action likely to adversely affect habitat critical to the survival of a species?

To date, the Register of Critical Habitat, maintained by the Department of the Environment and Heritage, does not contain any listing for *Persoonia hirsuta*.

The EPBC Act Administrative Guidelines on Significance describe critical habitat as areas that are necessary:

- For activities such as foraging, breeding, roosting or dispersal,
- For succession,

- To maintain genetic diversity and long term evolutionary development, or
- For the reintroduction of populations or recovery of the species/community.

The potential habitat for *Persoonia hirsuta* in the study area is not critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for succession, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of a population?

Persoonia hirsuta was not recorded in the study area. The proposed removal or modification of a total of 1.3 ha of vegetation that is potential habitat for *Persoonia hirsuta* is unlikely to disrupt the breeding cycle of a population.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Persoonia hirsuta was not recorded in the study area. Potential habitat for *Persoonia hirsuta* in the study area occurs in Western Sandstone Gully Forest and Shale Sandstone Transition Forest. The proposal will remove or modify a maximum of 1.3 ha of vegetation that is potential habitat for *Persoonia hirsuta*.

At least 6,024 ha of Western Sandstone Gully Forest and Shale Sandstone Transition Forest has been mapped in the locality (within 10 km of the study area) by NPWS. The area of habitat to be removed as part of the proposal equates to 0.02% of similar vegetation that exists in the locality. Furthermore, the area of potential habitat to be impacted by the proposed development occurs on the edge of a cleared paddock, therefore no area of potential habitat will become isolated or fragmented.

Is the action likely to result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat?

The proposal will result in the modification or removal of a maximum of 1.3 ha of vegetation that is potential habitat for *Persoonia hirsuta*. The proposal is unlikely to result in the establishment of invasive species, however, as a precaution, vehicles should be cleaned prior to earthworks undertaken on the site to ensure weed seed is not spread into bushland areas.

Is the action likely to interfere with the recovery of the species?

The recovery plan for *Persoonia hirsuta* is currently being prepared and is not yet available to the public.

Conclusion

Based on the above assessment, *Persoonia hirsuta* is unlikely to be significantly impacted by the proposed works and as such a referral under the provisions of the EPBC Act is not recommended for this species.

Vulnerable Species

Potential habitat occurs within the study site for one Vulnerable plant species listed on the EPBC Act: *Grevillea parviflora* spp. *parviflora*. Populations of *Grevillea parviflora* spp. *parviflora* that may occur within the development footprint are not considered important populations because:

- they are unlikely to be key source populations either for breeding or dispersal;
- unlikely to be necessary for maintaining genetic diversity; and/or ,
- the study site is not at or near the limit of the species range.

Grevillea parviflora ssp. *parviflora* was not recorded within the study area during the current survey.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to reduce the area of occupancy of an important population?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. The study area is therefore unlikely to support an important population of this species.

Is the action likely to fragment an existing important population into two or more populations?

The study area is not considered to contain an important population of *Grevillea parviflora* spp. *parviflora*. Furthermore, the proposal would not result in the isolation of any areas of potential habitat for the species, as the area impacted by the proposal exists on the edge of a cleared paddock.

Is the action likely to adversely affect habitat critical to the survival of a species?

To date, the Register of Critical Habitat, maintained by the Department of Environment and Heritage, does not contain any listing for *Grevillea parviflora* ssp. *parviflora*.

The EPBC Act Administrative Guidelines on Significance describe critical habitat as areas that are necessary:

- For activities such as foraging, breeding, roosting or dispersal,
- For succession,
- To maintain genetic diversity and long term evolutionary development, or
- For the reintroduction of populations or recovery of the species/community.

The potential habitat for *Grevillea parviflora* ssp. *parviflora* in the study area is not critical habitat, as the species was not recorded in the study area and so the area is not likely to be necessary for succession, to maintain genetic diversity and long term evolutionary development or for the reintroduction of populations.

Is the action likely to disrupt the breeding cycle of an important population?

The study area is not considered to contain an important population of *Grevillea parviflora* ssp. *parviflora*.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Grevillea parviflora ssp. *parviflora* was not recorded in the study area. Potential habitat for *Grevillea parviflora* ssp. *parviflora* in the study area occurs in Western Sandstone Gully Forest and Shale Sandstone Transition Forest. The proposal will remove or modify a maximum of 1.3 ha of vegetation that is potential habitat for *Grevillea parviflora* ssp. *parviflora*.

At least 6,024 ha of Western Sandstone Gully Forest and Shale Sandstone Transition Forest has been mapped in the locality (within 10 km of the study area) by NPWS. The area of habitat to be removed as part of the proposal equates to 0.02% of similar vegetation that exists in the locality.

Furthermore, the area of potential habitat to be impacted by the proposed development occurs on the edge of a cleared paddock, therefore no area of potential habitat will become isolated or fragmented.

Therefore, the proposed works are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal will result in the modification or removal of a maximum of 1.3 ha of vegetation that is potential habitat for *Grevillea parviflora* ssp. *parviflora*. The proposal is unlikely to result in the establishment of invasive species, however, as a precaution, vehicles should be cleaned prior to earthworks undertaken on the site to ensure weed seed is not spread into bushland areas.

Is the action likely to interfere substantially with the recovery of the species?

To date, no recovery plan has been written for *Grevillea parviflora* ssp. *parviflora*.

Conclusion

Based on the above assessment, *Grevillea parviflora* ssp. *parviflora* is unlikely to be significantly impacted by the activities and as such a referral under the provisions of the EPBC Act is not recommended for these species.

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APPENDIX V

Biosis Research Pty Limited

Report titled Aboriginal Archaeological Assessment

East Appin 66kV Switching Station and dated January 2006

**Aboriginal Archaeological
Assessment
East Appin 66kV Switching
Station**

January 2006

Chris Lewczak

**Report for
BHP Billiton**

**Aboriginal Archaeological
Assessment East Appin 66kV
Switching Station**

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- Matthew Richardson, Jamie Reeves, Robert Suansri (Biosis Research Pty. Ltd.)

ABBREVIATIONS

AHC	Australian Heritage Commission
AHIMS	Aboriginal Heritage Information Management System
AMG	Australian Map Grid
ATSIC	Aboriginal and Torres Strait Islander Commission
BP	Before Present
DEC	Department of Environment and Conservation
DIPNR	Department of Infrastructure, Planning and Natural Resources
DEH	Department of Environment and Heritage
ICOMOS	International Council on Monuments and Sites
LEP	Local Environmental Plan
NPWS	National Parks and Wildlife Service (now part of DEC)
REP	Regional Environmental Plan
RNE	Register of the National Estate
SHR	State Heritage Register

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SUMMARY

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake an Aboriginal archaeological assessment for the East Appin 66kV Switching Station and a short section of the associated power line. The proposed works will enable power to be extracted from the main Integral Energy line north-west of Appin to the West Cliff Mine. The switching station will step the power down from 66kV to 11kV prior to it being transferred to the West Cliff underground workings via a cable located in a borehole.

The proposed Switching Station and power line are located approximate 2.0 km north-east of the Appin township and approximately 200 m west of Georges River within the Wollondilly Local Government Area (Figure 2). The proposed route for the power line runs from the east along a fence line, west towards Appin Road (Figure 2).

The study area has been previously disturbed by agricultural practices and traverses cleared paddocks and areas of native vegetation, and is surrounded by similar landscapes to the north, south and west (Figure 2). To the east, the study area borders the Water Supply Reserve which links to the Dharawal State Conservation Area. The proposed works will involve clearing of vegetation and the construction of the Switching Station including fencing, cabling, access tracks and easement.

The aims of this study are to:

- conduct an Aboriginal archaeological background search for the Study Area;
- identify previously recorded Aboriginal archaeological sites within the Study Area;
- carry out a comprehensive archaeological survey of the Study Area;
- relocate and update the information for any previously recorded archaeological sites within the Study Area;
- record any new archaeological sites located during the survey;
- prepare mitigation strategies for any site that is potentially at threat.

An archaeological survey was carried out on 18 January 2006. The survey was carried out in association with representatives from the Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Title Claimants. The survey incorporated the area that has been designated for the switching station, power line easement and the access

track to the site from Appin Road, as well as the borehole sites located to the east of the switching station. The aim of the survey was to identify any Aboriginal remains or any potential archaeological sites present within the development area.

During the survey no new Aboriginal archaeological sites or potential archaeological sites were identified within the proposed development area.

1.0 INTRODUCTION

Cultural heritage legislation protecting Aboriginal and non-Aboriginal heritage places applies in New South Wales. These places are an important part of our heritage. They are evidence of more than 40,000 years of occupation of New South Wales by Aboriginal People, and of the more recent period of settlement by non-Aboriginal people.

Heritage places can provide us with important information about past lifestyles and cultural change. Preserving and enhancing these important and non-renewable resources is encouraged.

It is an offence under sections of legislation to damage or destroy heritage sites without a permit or consent from the appropriate body.

When a project or new development is proposed, it must be established if any cultural heritage places are in the area and how they might be affected by the project. Often it is possible to minimise the impact of development or find an alternative to damaging or destroying a heritage place. Therefore, preliminary research and survey to identify heritage places is a fundamental part of the background study for most developments.

The first stage of a study usually incorporates background research to collect information about the land relevant to the proposed development project (the Study Area). A second stage often involves a field inspection of this area.

Possibly the most important part of the study involves assessing the cultural heritage significance of heritage places in the Study Area. Understanding the significance of a heritage place is essential for formulating management recommendations and making decisions.

1.1 Project Background

Biosis Research Pty. Ltd. was commissioned by BHP Billiton Illawarra Coal (BHPBIC) to undertake an Aboriginal archaeological assessment for the East Appin Switching Station and power line. The proposed works will enable power to be extracted from the main Integral Energy line north west of Appin to the West Cliff Mine. The switching station will step the power down from 66kV to 11kV prior to it being transferred to the West Cliff underground workings via a cable located in a borehole.

1.2 Location and Study Area

The proposed Switching Station and power line are located approximate 2.0 km northeast of the Appin township and approximately 200 m west of Georges River within the Wollondilly Local Government Area (LGA, Figure 1). The proposed route for the power line runs from the east along a fence line west towards Appin Road (Figure 2).

The study area for this assessment includes the proposed location for the switching station and the curtilage area around the station and the access road and power line easement from Appin Road to the proposed site (Figure 2).

1.3 Aims

The aims of this study are to:

- identify previously recorded Aboriginal archaeological sites within the Study Area;
- conduct an Aboriginal archaeological background search for the Study Area;
- carry out a comprehensive archaeological survey of the Study Area;
- relocate and update the information for previously recorded archaeological sites within the Study Area;
- record any new archaeological sites located during the survey;
- prepare mitigation strategies for any site that is potentially at threat.

1.4 Consultation with the Aboriginal Community

The Tharawal LALC and the Cubbitch Barta Native Title Claimants have been identified as the relevant Aboriginal community organisations for the

Study Area. Lance Syme of the Tharawal LALC and Glenda Chalker of Cubbitch Barta were contacted at the outset of the project. Information was supplied to both organisations and representatives accompanied the archaeologists in the field. Both organisations were kept fully informed of any changes to the project or as new information was received.

Representatives from both Aboriginal groups were invited and participated on the survey, providing input of any queries or concerns that they may have had out in the field.

2.0 BACKGROUND INFORMATION

2.1 Environmental Background

The environmental background to the Study Area is provided in order to give a context to the archaeological assessment. The environmental aspects of an area will influence the type of archaeological remains that are likely to be present.

Firstly, the environmental conditions of the Study Area may have influenced the land use by people in the past and, secondly, conditions will also affect the processes by which sites are preserved. Environmental values of an area can also contribute to the cultural significance and attachments people have to a place.

The following background is a summary of information relevant to the current assessment of archaeological values of the Study Area.

2.1.1 Geology & Landforms

The Study Area lies within the Illawarra region and is located on the boundary of a geological feature known as the Woronora Plateau and the Cumberland lowlands. The study area is located within the Blacktown landscapes within the Illawarra region.

The Blacktown landscape is characterised by gentle undulating rises located on the Wianamatta Groups Shale. The local landscape also consists of broad rounded crests and ridges, and is almost completely cleared of the native eucalypt woodlands from agricultural activities in the area. (Hazelton & Tille 1990).

Soil deposits in the area vary in depth and type. Only limited soil types in this region are considered fertile, such as the greyish brown loam that occurs in pockets near the top slopes and at the bottom of gullies, otherwise the topsoil is a hard setting brown clay that has become exposed from the clearing of the land and subsequent erosion. Depth of soil ranges from a maximum 150 mm of soil on crests and upper slopes, to 500 mm depth on lower side slopes and up to 2 m deep in drainage depressions and poor drainage areas (Hazelton & Tille 1990).

2.1.2 Climate

In general, climate within the Study Area is warm-temperate. However, there are significant variations within the various landscape types. Average maximum daytime temperatures in the Wollongong Region range from 28° C in summer and 17°C in winter. Conditions in the Study Area would have been relatively mild during past human habitation of the region and would not have

posed any major restrictions to a hunter-gatherer lifestyle prior to historical settlement.

2.1.3 Flora & Fauna

The flora typical of the area is mostly cleared eucalypt woodland. This has been a direct result from settlement and land clearing that has occurred in the area since Appin was settled in c1811. Prior to this the area would have been summarised as mostly uncleared eucalypt woodlands, open (dry sclerophyll) forest and tall open (wet sclerophyll) forests. In some areas dense scrub dominates the mid- and understorey. The Woronora Plateau would have provided a wide diversity of resource zones, in a relatively small geographic area, for the Aboriginal hunter-gatherer population. This diversity is even greater when it is considered how close the coastal resource areas are to the rugged plateau.

Land mammals such as kangaroos and arboreal mammals such as possums would have been important prey species. Birds, reptiles and fish would also have been important resources. As well as being important food sources, animal products were also used for tool making and fashioning myriad utilitarian items. For example, tail sinews are known to have been used as a fastening cord, while ‘bone points’, which would have functioned as awls or piercers, are often an abundant part of the archaeological record.

2.2 Aboriginal History

2.2.1 Ethnohistory & Contact History

It is generally accepted that people have inhabited the Australian landmass for at least 40,000 years. Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. The timing for the human occupation of the Sydney Basin is still uncertain. The earliest undisputed radiocarbon date from the region comes from a rock shelter site on the western side of the Nepean known as Shaws Creek K2, which has been dated to 14,700 years before present (BP) (Attenbrow 2002). This site is over 50 km north from the Study Area along the Nepean River. To the south, along the coast just north of Shell Harbour, the site of Bass Point has been dated at 17,101 +/- 750 BP (Flood 1999).

To a large extent our knowledge of the social organisation of Aboriginal people prior to European contact is reliant on documents written by European people. Such documents are necessarily affected by the inherent bias of the class and cultures of these authors. They can, however, be used in conjunction with

archaeological information in order to gain a picture of Aboriginal life in the region.

The Appin region has been identified as the traditional lands of the Dharawal language group. This language was spoken from the south side of Botany Bay south to Shoalhaven River and inland to Appin and Campbelltown (Tindale 1974). The Wodi Wodi are said to be a group who spoke this language and lived in the area.

The traditional social organisation of the Wodi Wodi would have consisted of clans and bands. Marriage was between clans, and bands were composed of members of these clans. Bands hunted, camped and collected resources in areas that may have more than a single clan. Attenbrow (2002) clarifies this further, saying “whilst the relationship of clan to country was principally religious in character, that of band to range was economic.”

With the arrival of the Europeans in the late 1700s, the Aboriginal people of the Illawarra region suffered a swift and catastrophic change. Europeans journeyed into the region: cutting down trees for building materials and firewood, clearing vegetation for pastoral and agricultural purposes. Aboriginal people were displaced from their traditional hunting grounds, many times through conflict and bloodshed. A massacre site is located at Cataract River, not far from the study area (McGill 1994; PHA NSW Heritage Register SHI no 4671006). Hostilities in the Appin locale were at a breaking point in 1814. A drought exacerbated the hostilities between European farmers and the Aboriginal people as pressure was placed on food resources. Aboriginal people from other groups also began to arrive in the area after being dispossessed from their own lands. In 1814, on a farm, a militia group shot and killed an Aboriginal boy, and the militia men were subsequently attacked, one fatally. This led to brutal retaliatory attacks on both sides until in 1816 Governor Macquarie ordered his British troops to punish the Aboriginals and force them far away from the area. His officer, Captain Wallis, as ordered, found a Dharawal/Tharawal camp at Cataract Gorge, near Broughton Pass, where most were hiding in the bushes. In the ensuing conflict, women and children were killed, many desperately trying to flee only to tumble to their death over the gorge edge. Only a few survived, as prisoners. Disease also began to ravage the Dharawal/Tharawal group. At this time there were approximately 3,000 Dharawal/Tharawal people living in the Illawarra, but by 1899 their numbers had declined to only 33 people of non-mixed descent.

2.2.2 Previous Archaeological Work

There have been a number of previous archaeological surveys undertaken in the

Appin area. The majority of these are associated with long wall mining within the Appin area.

The earliest dated report concerning archaeological works for the area that is held in DEC is an archaeological investigation for Longwall 27 in Appin Area 2 (Sefton May 1995). The survey was to identify sandstone overhangs that contain art within the area of the new mining longwall and to determine whether they were potentially susceptible from impact from subsidence. Two open camp sites (consisting of grinding grooves) and six Aboriginal overhang sites, five with art and one with potential archaeological deposits, had previously been identified by the Illawarra Prehistory Group and the investigating archaeologists believed these sites to be close to the Longwall 27 Study Area (Sefton May 1995). The report recommended that these sites be relocated and a monitoring regime be established for seven of the sites outlined in the report.

In 1995 Sefton started to record seven archaeological sites that had been identified in an earlier report (Sefton May 1995).

In March 1996 Navin Officer undertook the investigation of three proposed borehole sites associated with the Appin Mine. These three borehole sites were assessed and no new archaeological sites were reported (Navin Officer March 1996).

Archaeological investigations have been conducted in the Appin Area 4 mining area by Sefton (Sefton June 1996). The report looked at the potential mining and subsidence area for the new mining domain. The archaeologically surveyed area was directly on the northern side of Wilton Road. From the maps that are included in the report, only the area along the road and immediately next to the river were surveyed in the area north of the current Study Area. The survey also included an area within the Cataract River gorge; however, this was limited to the top sections of the gorge. Six new Aboriginal archaeological sites were recorded during the survey; however, no new sites were located within the current Study Area.

An archaeological survey was conducted by AMBS in 1996 for the longwall mining application for Longwalls 14 and 15 at Tower Colliery (AMBS March 1996). The survey crossed the junction of the Nepean and the Cataract rivers. The survey only located one new scarred tree site. No other Aboriginal archaeological sites were recorded.

South of the Cataract River from the survey area, four seismic lines were surveyed by Navin Officer in 1996. The field survey was conducted to identify any Aboriginal archaeological sites that may be impacted by the drilling of the seismic lines (Navin Officer September 1996). During this survey no new

aboriginal archaeological sites were located.

Archaeological surveys have also been carried out for Appin Area 4 longwalls 406 to 408 (Sefton March 2002). These surveys were located approximately 4 kilometres south of the current Study Area. The survey recorded one new art site, two sandstone shelters with deposits and one shelter with art and archaeological deposit (Sefton March 2002). It was recommended that a permit be sought to destroy one of the sites, on the basis that the predicted subsidence would damage the site. A monitoring regime was also recommended for two of the rock art sites.

2.2.3 Previously Recorded Aboriginal Sites close to the Study Area

A 5 km by 5 km Aboriginal Heritage Information Management System (AHIMS) search was conducted around the east Appin switching station to identify previously recorded aboriginal archaeological sites within and around the study area. This large-scale search around the study area allows for an understanding on the types of Aboriginal sites and archaeological work that has been conducted in the region.

A total of thirteen recorded Aboriginal archaeological sites have been identified around the study area. No sites have been previously recorded within the study area. The closest of these thirteen sites are located approximately 2 km north of the study area. These three sites (52-2-2234; 52-2-2241; and 52-2-2243) are rock overhangs, shelters, that contain Aboriginal art, and all are located within the gorge area close to the Georges River (Figure 3; Table 1).

Of the thirteen previously recorded Aboriginal sites located within a 5 km radius of the study area, six of these sites are “open camp sites”. This term refers to sites where two or more stone artefacts have been located within a small area (Table 2). These sites are all located above the gorge areas, on the plateau (Figure 3). The seven remaining sites all contained Aboriginal art; three of these sites also contain stone artefacts (Table 2). All of these sites are located closer to the river area where the topography is more suited to instances of sandstone overhang shelters.

2.2.4 Archaeological predictive model

From the AHIMS search results no sites are situated within the study area of this project. This does not indicate that there are no Aboriginal archaeological sites within the area; it is likely that this specific area has not been surveyed before.

Based on the sites that have been located within a 5 km radius of the study area, a clear predictive model of the types of sites that are likely to occur within

the study area can be formulated. Based on the topography alone, no art site will be situated within the study area, as it is located above the river area in the open plateau area. From the proximity of the study area's eastern boundary, which comes close to the Georges River, there is the possibility for overhangs in this area; however, this is well outside the study area.

There is the possibility for stone artefacts to be located within the area. Other sites that have been record in the area indicate these sites are located above major creek lines and rivers: areas that were important to Aboriginal people as a food and a cultural resource.

A portion of the study area also includes a possible vegetated area above the river beyond the property boundary. This area has the potential to contain Aboriginal scarred trees. Scars were created on trees to remove bark to make items such as shields, or to create a cultural marker. While there have not been any recorded within the local area, there is still the possibility that scarred trees may be found in areas that have not been cleared for farming.

DEC ABORIGINAL SITES REGISTER NO	Site Name	Site Features
52-2-0021	Douglas Park	Open Camp Site
52-2-0024	Sugarloaf Tunnel, Mount Gilead 4	Shelter with Art
52-2-2234	Georges River No.1	Shelter with Art
52-2-2235	Georges River No.6	Open Camp Site
52-2-2237	Ousedale Creek No.3	Shelter with Art & Deposit
52-2-2238	Ousedale Creek No.4	Shelter with Art & Deposit
52-2-2239	Nepean River No.8	Open Camp Site
52-2-2240	Georges River No.7	Open Camp Site
52-2-2241	Georges River No.5	Shelter with Art
52-2-2242	Georges River No.4	Shelter with Art
52-2-2243	Georges River No.2	Shelter with Art & Deposit
52-2-2244	Georges River No.3	Open Camp Site
52-2-2265	Leafs Gully no.1	Open Camp Site
52-2-0021	Douglas Park	Open Camp Site

Table 1: Previously recorded Aboriginal archaeological sites near the East Appin 66kV Switching Station.

Site Type	Count
Open Camp Site	6
Shelter with Art	4
Shelter with Art & Deposit	3
Grand Total	13

Table 2: Summary of Site types located within a 5 km radius of the study area.

3.0 ARCHAEOLOGICAL SURVEY

3.1 Archaeological Survey – Methods

The archaeological survey was carried out on 18 January 2006. One member each from the Cubbitch Barta, Glenda Chalker, and the Tharawal Local Aboriginal Land Council, Cliff Foley participated in the survey.

The survey began at the proposed site of the switching station. The area was walked over looking for area where ground visibility was greatest to examine the soil within the area, as well as to inspect for stone artefact remains.

The majority of the area lies within a clear paddock. This area has been cleared and at one stage ploughed, as evidenced by the ground disturbance that has occurred in the area. The area is currently covered with grass (Plate 1). There were small areas within the grass cover where the ground could be viewed; however, these sites were limited. The topsoil in the local area consists of a grey-brown grainy sandy loam, covered with sandstone flecks, with some larger (20–40 cm) sandstone rocks (Plate 2).

The area beyond the fence lines was surveyed next. This area has not been cleared and is presently vegetated. Rock outcrops and benches are present within this area, continuing approximately 40 m beyond the fence line before the ground drops away towards the river (Plate 3). The sandstone benches within the study area are stepped flat rock ledges, less than 1 m high (Plate 4). There are pockets of shallow soil deposits; however, the majority of this area is exposed rock (Plate 4). Also within this area, two boreholes are proposed to be drilled.

The proposed power-line easement and road access from Appin Road heading east to the switch station was also surveyed. The route runs along the northern boundary fence of the property. The area is currently incorporated in cleared horse paddocks. The ground has been disturbed through clearing and ploughing. Ground visibility was limited as the whole of the area was covered with grass; however, there were bare patches of ground where the ground visibility improved. These areas were targeted for the survey.

3.2 Aboriginal Archaeological Survey – Results

No Aboriginal archaeological sites were located within the study area during this survey. The majority of the area has been disturbed from clearing and agricultural activity since European settlement in Appin (c.1811). In

areas where the ground visibility was better, no evidence of Aboriginal archaeological remains, such as stone artefacts, were present. It was also assessed that no potential Aboriginal Archaeological sites or deposits were present on the site.

In the eastern portion of the study area, within the uncleared section, the ground was mostly rock outcrops before dropping off towards the river. Despite this area being outside, but on the border of the study area, this area was briefly examined for rock overhangs and the potential for rock art sites. The rock in this area, however, was primarily tumble and no evidence of rock shelters or overhangs was present within the immediate area.

4.0 MANAGEMENT ISSUES AND RECOMMENDATIONS

4.1 Introduction

Cultural heritage places provide us with evidence of past human activity. Heritage places may be confined to a small area, or be represented by a complex of features, including a cultural landscape. Places of human activity in the past are affected by the actions of the present, particularly urban expansion and agricultural processes. This means that cultural heritage places are a diminishing resource.

Cultural heritage places are valuable, not only for the scientific records of the past they provide, but also for their social significance. Many Aboriginal places, for example, have a special significance to Aboriginal communities as places where traditional life has continued and places that may have sacred or symbolic significance.

Many heritage places may also be outstanding examples of artistic and creative achievement. Heritage places are valuable to Australians — and the rest of the world — as they not only provide a link with a culturally rich past, but they can contribute to recreational and community life.

Heritage places may also have economic potential (Pearson & Sullivan 1995: 15). These values should, where possible, be protected and handed on to future generations.

4.2 Management Recommendations

No Aboriginal sites were recorded within the study area during this survey.

In the event any unanticipated cultural heritage material is uncovered during any excavation stage for this project, all excavation works should cease and notify

- Department of Environment and Conservation
- Consulting Archaeologist (Chris Lewczak or Jamie Reeves)

4.3 Report Lodgement

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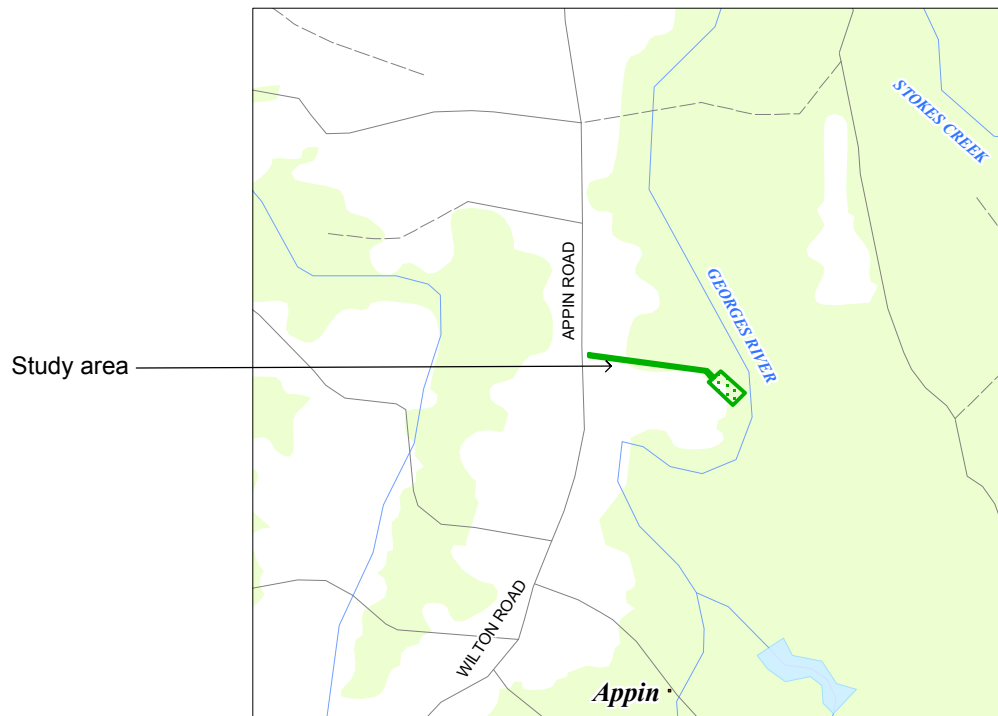
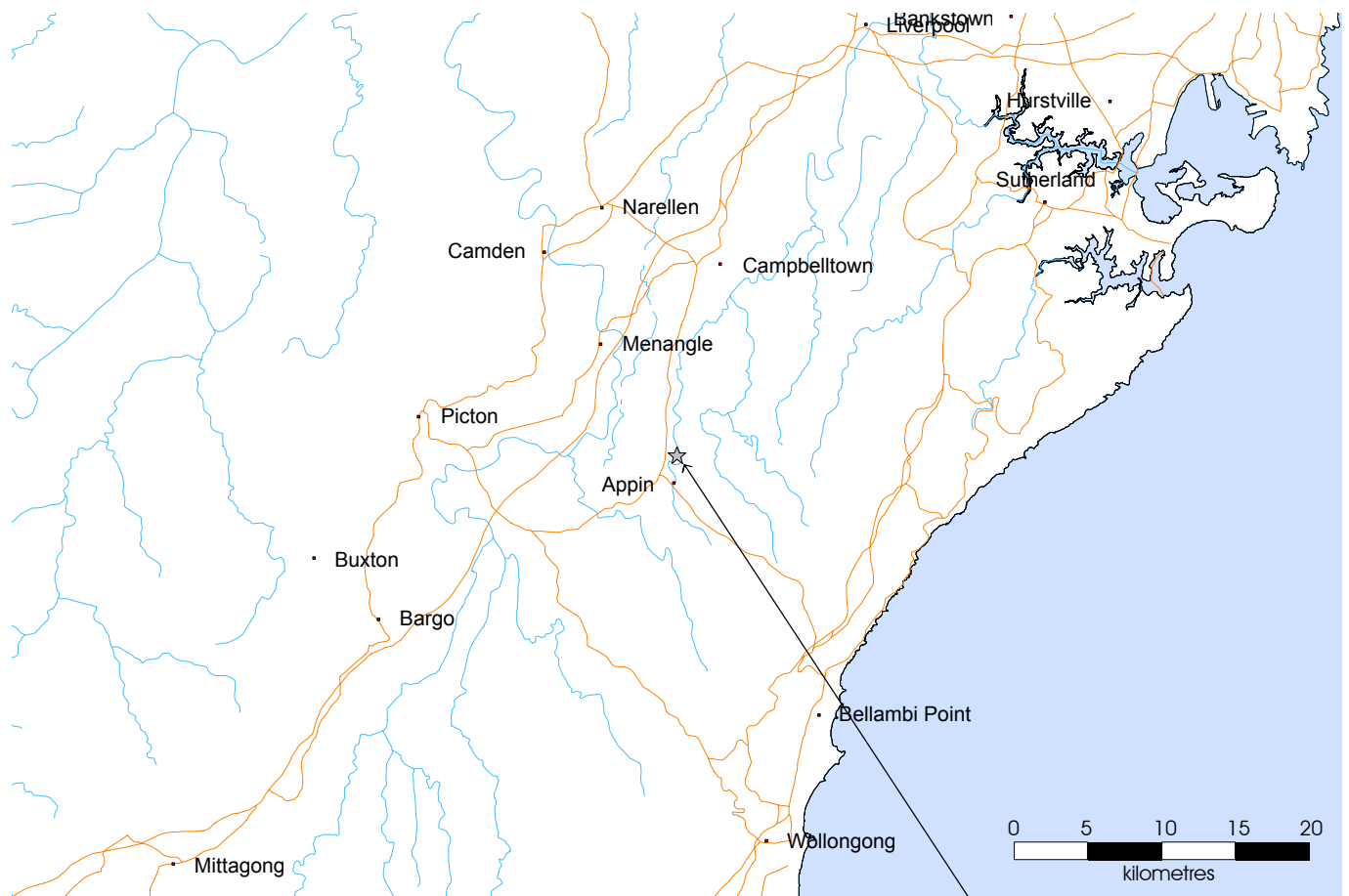
BHP Billiton Illawarra Coal

4.4 Independent Review of Reports

Archaeological reports and the management recommendations contained therein will be independently reviewed by the Cultural Heritage Services Division of the NSW Department of Environment and Conservation, the relevant Aboriginal community and the NSW Heritage Office.

Although the findings of a consultant's report will be taken into consideration, recommendations in relation to managing a heritage place should not be taken to imply automatic approval of those actions by the Department of Environment and Conservation, the Aboriginal community or the Heritage Office.

FIGURES



Acknowledgements: Geoscience Australia (1:250000 - SI/56-5).



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Figure 1: Location of the study area in a regional context.

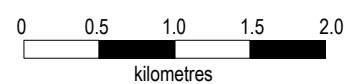
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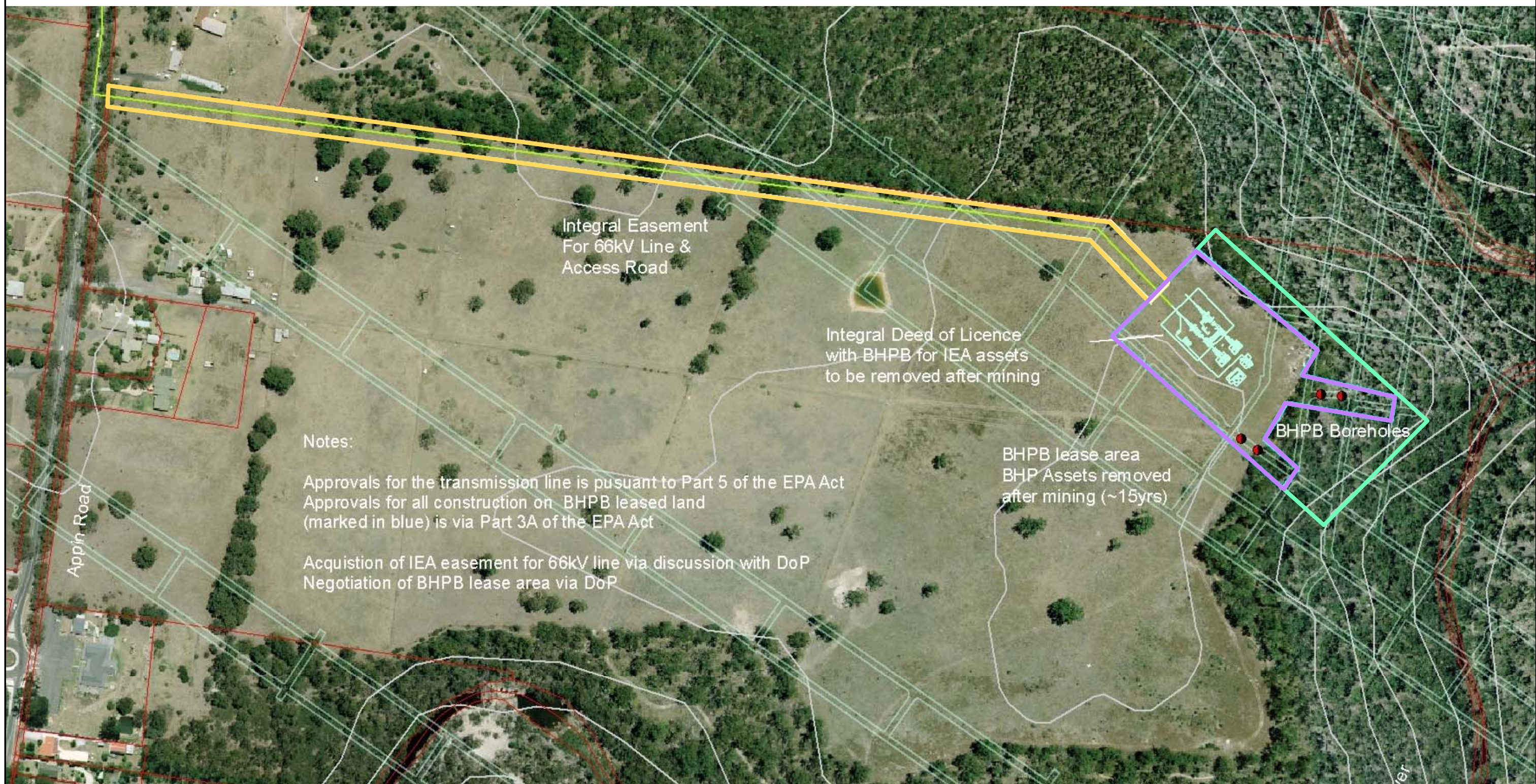
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Scale:



-  Powerline easement
-  Proposed Development Boundary (based on new photograph)
-  Extent of area surveyed in current survey

Acknowledgements: BHP Billiton



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Figure 2: Proposed plan of the study area.

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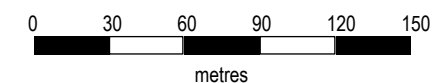
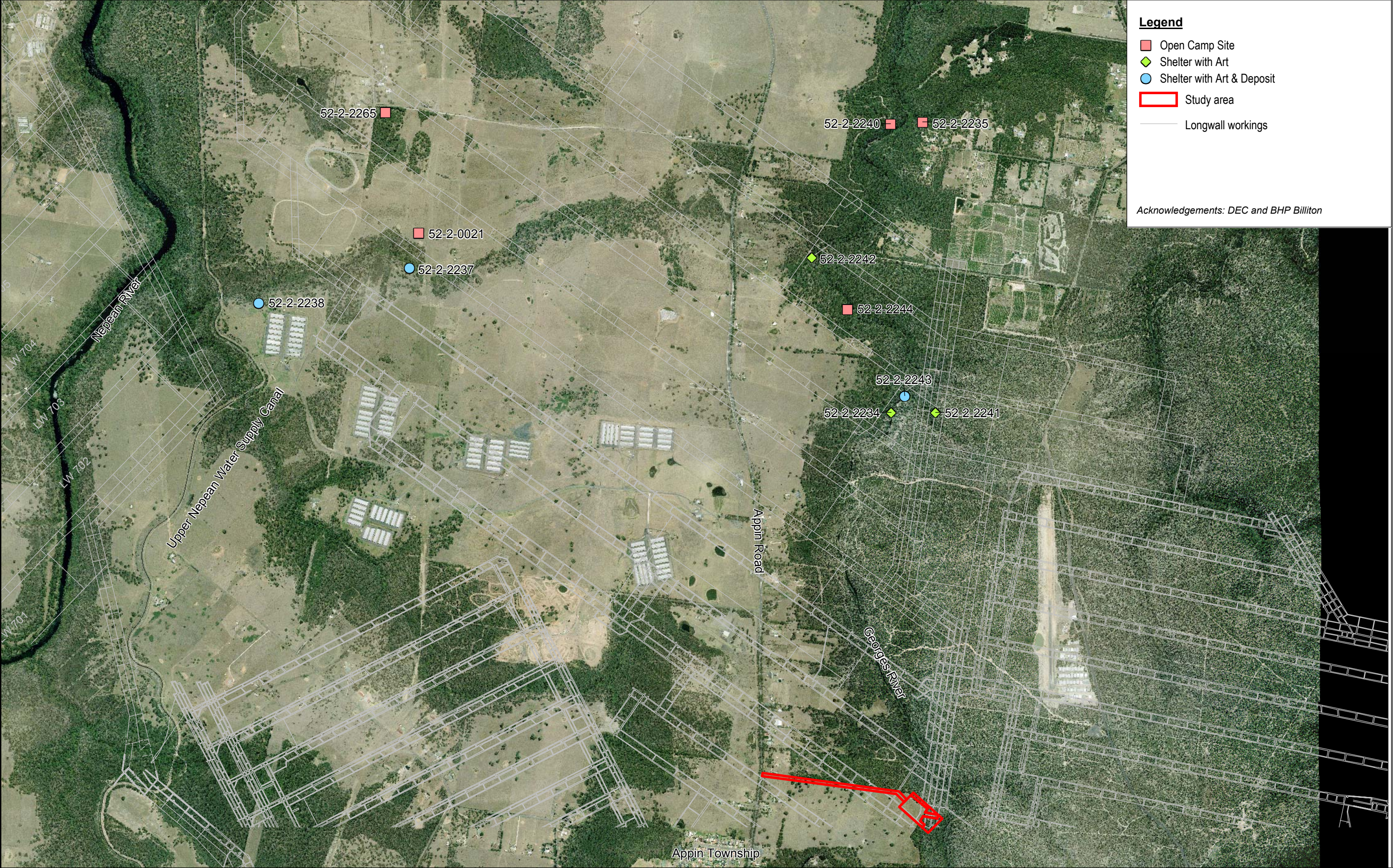


Figure 2: Proposed plan of the study area.





Legend

- Open Camp Site
- Shelter with Art
- Shelter with Art & Deposit
- Study area
- Longwall workings

Acknowledgements: DEC and BHP Billiton



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Figure 3: Aboriginal artefacts within the vicinity of the study area.

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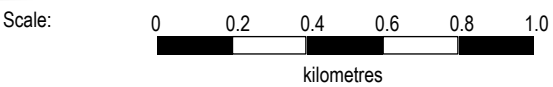


Figure 3: Aboriginal artefacts within the vicinity of the study area.



PLATES



Plate 1: View of the location of the East Appin 66kV Switching station.



Plate 2: Bare patch within the paddock area where ground visibility was improved.



Plate 3: Drop off down to the river outside the eastern boundary of the study area.



Plate 4: Topography within the vegetated (eastern) section of the study area.

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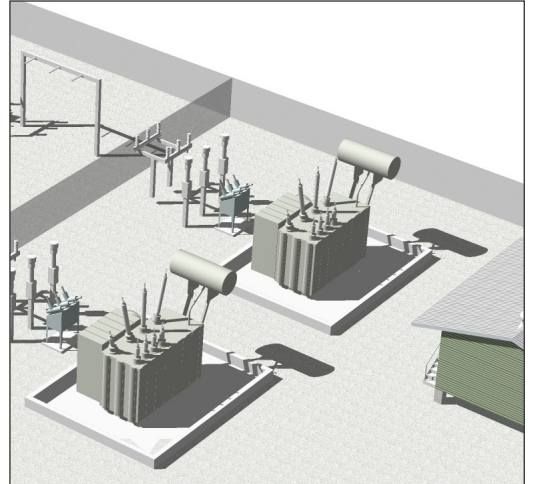
APPENDIX VI

Maurice Hayler and Associates

Architects

**Report titled Visual Impact Study. Proposed East Appin
66kV Switching Station. Appin NSW.**

January 2006



VISUAL IMPACT STUDY

PROPOSED EAST APPIN 66kV SWITCHING STATION

APPIN NSW

**BHP BILLITON
ILLAWARRA COAL**

January 2006

Prepared by:



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VISUAL IMPACT STUDY PROPOSED EAST APPIN 66Kv SWITCHING STATION

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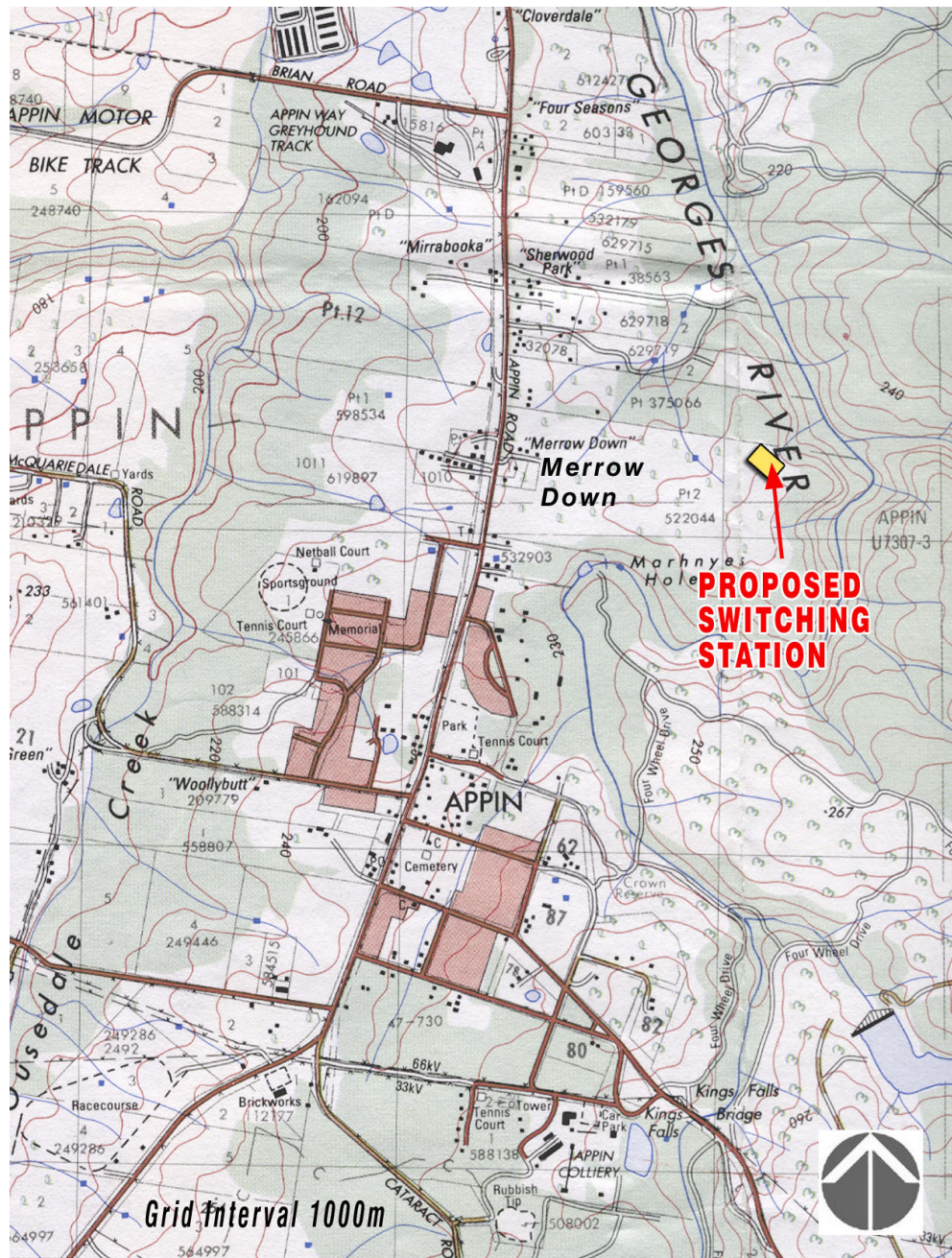


Figure 1 - Location map of East Appin Switching Station

Proposed East Appin 66kV Switching Station

Visual Impact Study

Introduction

This study was commissioned to assess the visual impact on the local community of the proposed electrical switching station at East Appin.

This study covers the East Appin 66kV Switching Station. The associated power line section of a larger proposal to convey electricity from Integral Energy's power line main (located approximately 2.5km to the west of, and roughly parallel to, Appin road) to the West Cliff Colliery underground mine will be assessed in a future report.

This report looks at the visual impact of the last section of the high voltage power line, immediately adjacent to and feeding into the switching station.

Background

The West Cliff underground coal mining operations require an 11 kilovolt electricity main to power machinery and lighting. In order to achieve this, it is proposed to source electricity from the Integral Energy 66 kilovolt main which is located approximately 2.5 kilometres to the west of Appin road.

For practical reasons, electricity is transmitted at high voltages (in this case 66 kilovolts) over long distances and is then transformed down into lower voltages (in this case 11 kilovolts) at switching stations close to the point where the electricity is required.

Location and Setting

The switching station is proposed to be located at the rear of Merrow Down farm which is located on the east side of Appin Road approximately 500 metres north of the Appin township. The switching station is to be sited at the rear of the property 900 metres east of Appin road.

Appin is a rural village and Merrow Downs is one of a number of small farms in the area.

Description of Proposed Works

It is proposed that the 66 kilovolt electricity supply be supplied via aerial wires/cables supported on power poles. These power poles will also carry an 11 kilovolt supply. It is proposed that the power poles are concrete in construction for strength, durability and termite resistance. They are approximately 18 – 20 metres high, located approximately

100 metres apart and will support 3 conducting cables for each of the 66kV and 11kV supplies. The conducting cables are separated from the poles by ceramic insulators. (See Appendices 5 & 8)

The 66 kilovolt and 11 kilovolt cables terminate within the switch station enclosure (the subject of this study) . The 66 kilovolt cables connect to a galvanized steel switching gear frame - insulated from the frame by ceramic insulators. From here the 66 kilovolt line is connected to circuit breakers, then into transformers to be reduced down to 11 kilovolts. It is then conducted to a control room from which the electricity is fed via a cable into the ground, through a bore hole, down to the mine workings approximately 480 metres below the surface.

The most significant structures of the switch yard are the high voltage switching steel framework, transformers (2 in this case) the switch and control rooms (2 buildings in this case) and the security fence. (See attached Appendix 3)

General Observations

Switching stations and the like have an industrial appearance (see Appendix 4) . The equipment is generally grey in colour which is a neutral colour that blends reasonably well into the environment. Switch station buildings which contain control equipment and the like are usually brick, concrete block or metal clad with steel sheet roofing, the colours for which vary. In this proposal the buildings will be lightweight and metal clad. Perimeter fencing is either galvanized finished or painted (usually black). Perimeter fencing was traditionally cyclone wire (galvanized finish) with strands of barb wire above. However recent safety legislation now requires fencing which is less penetrable. The choice of colour for the fence is important as a dark neutral colour will improve the transparency of the fence and consequently reduces its visual impact.

Recommendations

To reduce the visual impact and blend the switch station into the background the following measures are recommended:

- The perimeter fence should be paint finished as follows: Charcoal or dark grey - matt finish
- Roofs of associated buildings: equal to Colorbond “Windspray” (grey) or “Wilderness” (grey green)
- Metal wall cladding: equal to Colorbond “Windspray” (grey) or “Wilderness” (grey green)

Summary

In terms of visual impact the switching station is well located – at a distance of approximately 900 metres from Appin road so that its visibility from Appin road would be minimal.

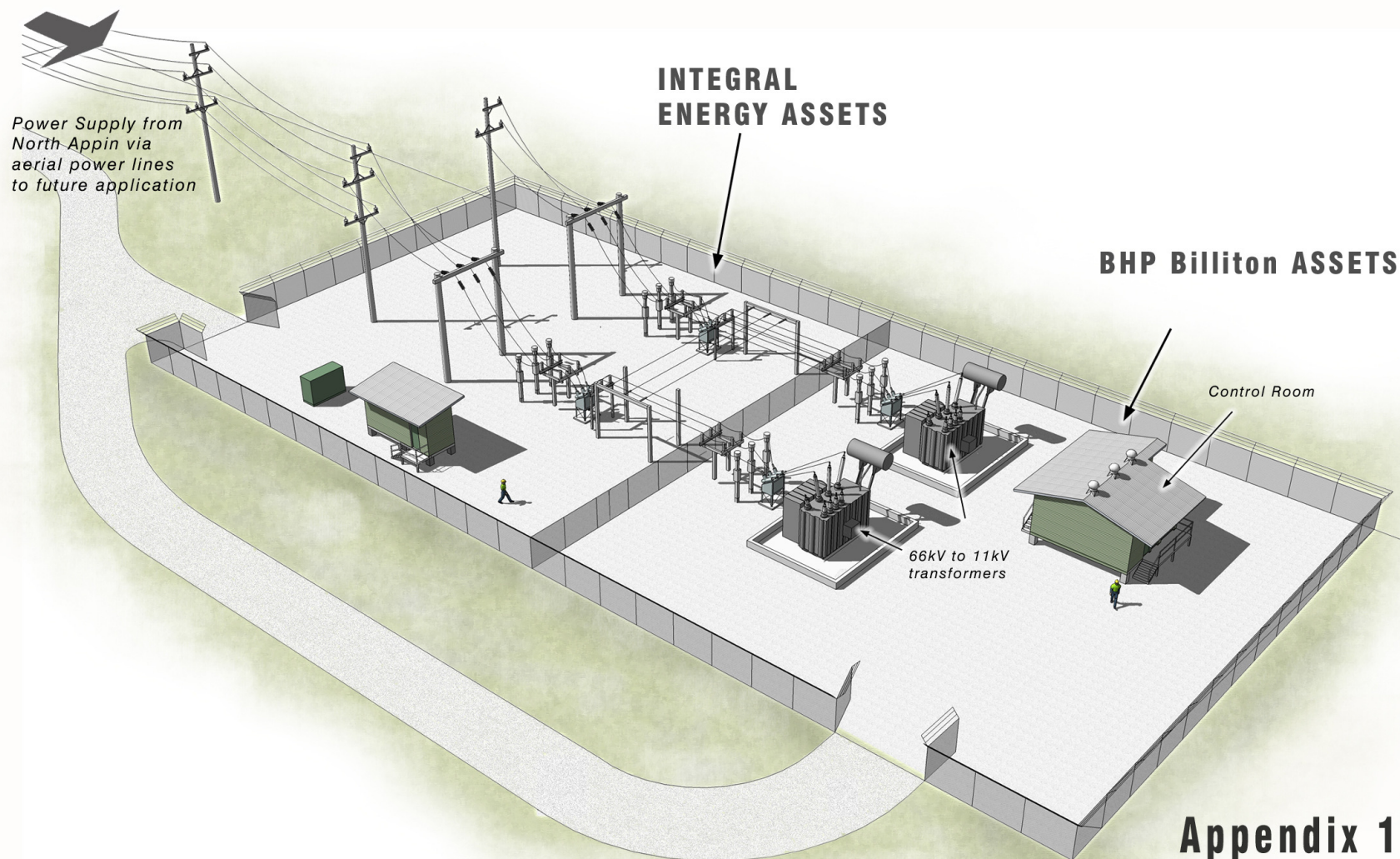
Appin road has existing avenue-style mature tree planting along the road reserve with trees up to 20 metres in height. Between Appin road and the proposed switching yard there are 2 separate tree rows and a copse (See appendix 7). The copse extends approximately 100 metres north-south and about 100 metres deep and is located about 200 metres from Appin road. One tree row is parallel to, and 150 metres from, Appin road and extends for about 200 metres north-south. Further to the east is another tree row about 500 metres from Appin road extending approximately north-south for a distance of approximately 150 metres. All of which together screen the view of the switching station from Appin road

Given the above existing circumstances and by adopting this report's recommendations, it is not likely that the proposed switching station would be noticeable or offensive to a general member of the public when viewed from Appin road.

Maurice Hayler

Architect

January 2006



Maurice Hayler & Associates
ARCHITECTS

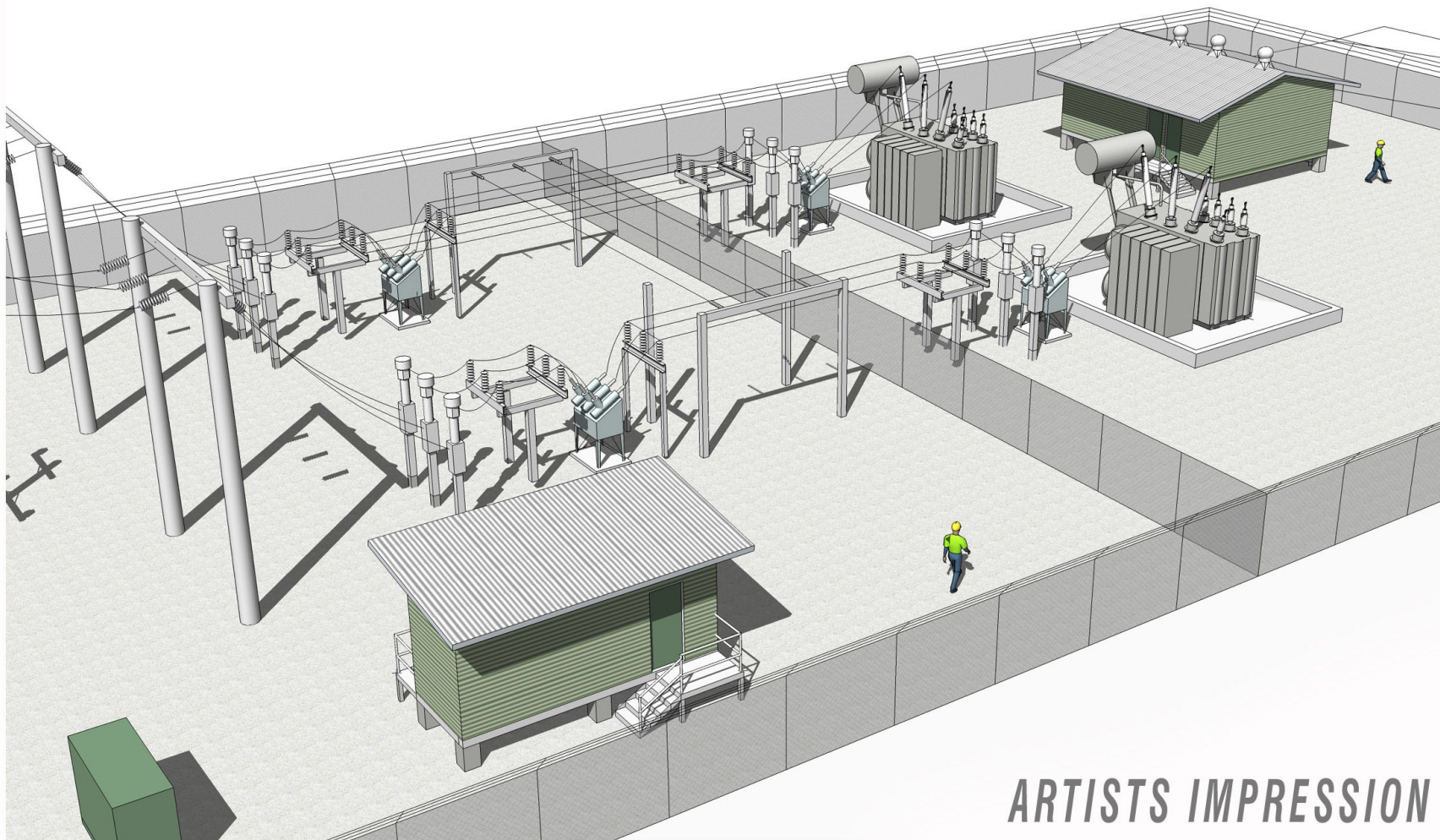
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PROPOSED EAST APPIN 66kV SWITCHING STATION

Appendix 1

ARTISTS IMPRESSION



ARTISTS IMPRESSION

PROPOSED EAST APPIN 66kV SWITCHING STATION

Appendix 2



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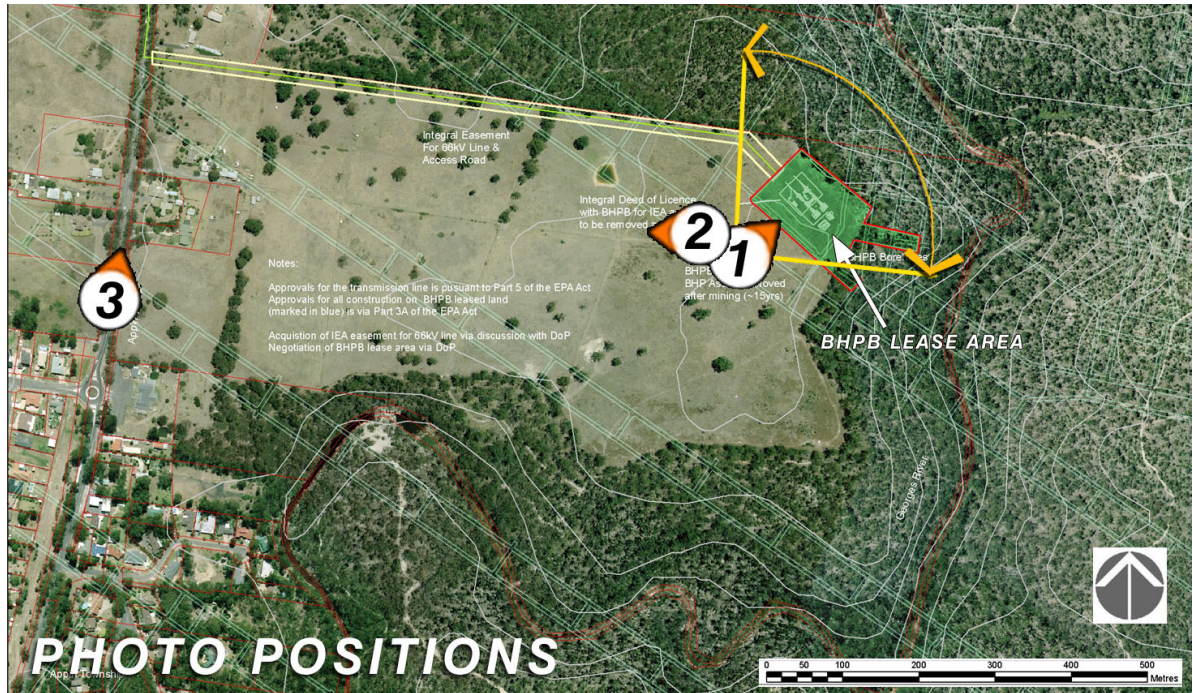
Appendix 3 – Photographs of typical high voltage electrical switch gear equipment



Appendix 4

Top: An existing (66kV) substation located in *The Lachlan Drive Appin* showing the older style cyclone wire security fence.

Below: The newer style security fence used by Integral Energy



Aerial photo showing camera positions



Panorama of joined photographs showing the landscape through a 90 degree arc (from camera position 1 above)



Photograph showing the landscape looking west toward the rear of Merrow Down homestead (from camera position 2 above)

Appendix 5



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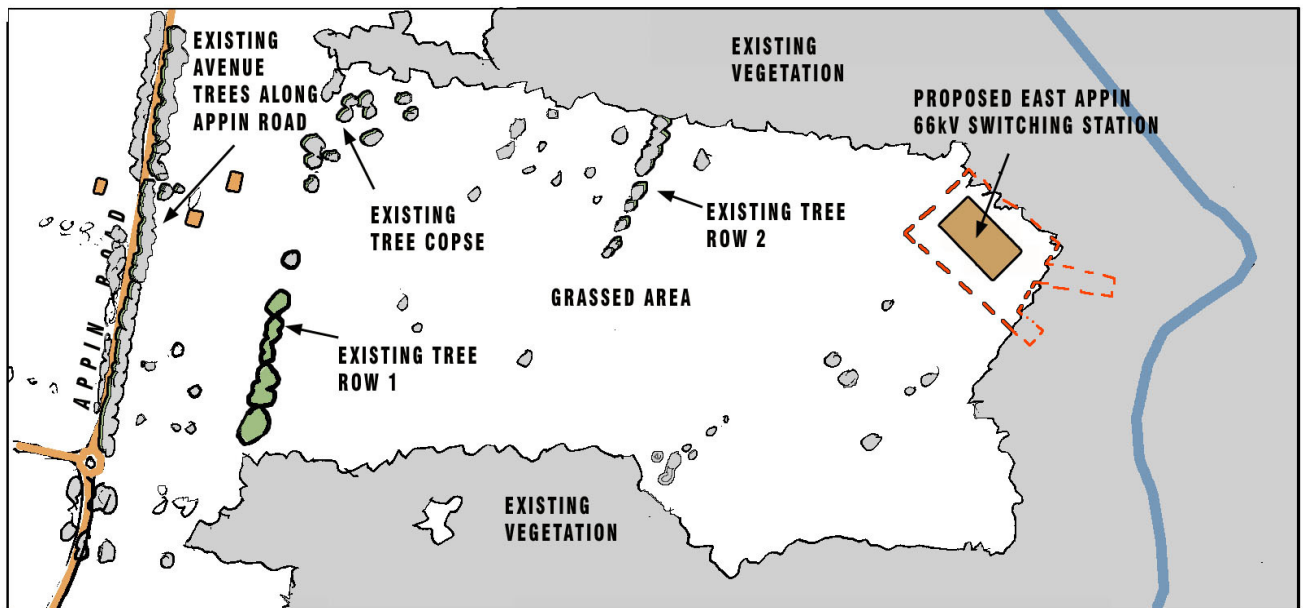
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ARTISTS IMPRESSION

APPENDIX 6

PROPOSED EAST APPIN 66kV SWITCHING STATION



Drawing showing existing screening vegetation



Photograph looking north along Appin road showing existing mature avenue planting (Camera position 3 see appendix 5)

Appendix 7



Photograph of existing concrete power poles in the countryside at Galong near Young NSW. The lower section of conductors and cross arms have been painted on to the photo to show the proposed situation for Appin

Appendix 8 – Typical power pole