5. Land Use and Environmental Effects

This section describes the existing environment and surrounding planning controls, land uses, biophysical and cultural environment and provides an assessment of the anticipated impacts on these systems.

5.1 Land Use of Proposed Mine Site and District

The land use on which the proposed mine site is situated is vacant Crown land, vegetated with eucalyptus woodland and used primarily by the local residents to access the adjacent Blue Mountains National Park. The site has little agricultural potential having very shallow, infertile soils.

The land use of neighboring land includes:

- **coal mining activities** - industrial usage of the land to the north and east by Centennial Coal Company for its reject emplacement areas, pit top facilities and the rail loading loop associated with Clarence Colliery.

- **sand quarrying activities** - the Rocla Sand Quarry is located immediately to the south of the proposed mine site. Kables Sands is also located in the vicinity, some 2 km to the north-west of the Clarence Colliery and Boral used to operate a sand quarry on the plateau nearby.

- **recreational and environmental protection -** the adjacent Blue Mountains National Park to the east is used for protection of local flora and fauna and for recreational activities. It has recently been listed as part of the Greater Blue Mountains World Heritage Area, which covers seven national parks (Blue Mountains, Wollemi, Yengo, Gardens of Stone, Kanangra-Boyd, Nattai and Thirlmere Lakes) in the Greater Blue Mountains district. The area has been listed as World Heritage on the basis of eucalypt biodiversity, wilderness and cultural values of the Greater Blue Mountains area.

  The Wollemi Wilderness is located approximately 600 m to the north-east of the site. This site is the largest declared wilderness area in the state, covering an area of 361,000 ha (NPWS information as at June 2000).

  Local areas of particular recreational interest include Gooches Crater, a picturesque area visited by local bushwalking groups. The Zig Zag Railway is located some 5.5 km to the west of the site.

- **residential usage** - residential land use occurs in Newnes Junction village, located immediately to the south west of the site. The village consists of about six dwellings, five of which are permanently occupied and one of which is used as 'weekender'. There is potential for other dwellings to be constructed in the village at some time in the future.

- **transportation routes** - the Main Western Railway line and the Bells Line of Road are both located to the south of the site, and are two of the major east-west transportation arteries for the state.

- **forestry activities** – State Forests own extensive areas of the land to the north and west of the site.

5.1.1 Land Use Implications

The proposed development would be confined to a Mining Lease largely within EL 4192 and would involve no immediate requirement for property acquisition or adjustments within the lease area. A key feature of the project is that it is remotely located with a limited number of private residences nearby. With the proposed safeguards, the actual impacts of the quarry on the land use will be minimised, particularly during the earlier phases of the operation.

Newnes Junction Village

The closest residences are located in Newnes Junction village, to the south of the proposed mining area. A buffer zone of 200 m between the mining lease and the closest residential dwellings will be maintained to limit the impact of the operation on these dwellings. These houses will have no direct views of the operation and land use in the area will remain residential.

Impacts on the village will be associated with construction traffic since the access from the site to the Bells Line of Road will be the same as that from the village to the Bells Line of Road. Mine traffic will turn off before reaching the village so impacts will be minimised. During the operation of the facility heavy vehicles will be limited since ore will be transported by road. Consequently, transportation impacts on local residences will be limited.

Dust impacts are anticipated to be minimal. During the later stages of mining the stringent noise criteria associated with the operation may not be able to be met and consequently impacts on local residences will occur. NKPL are prepared to purchase noise affected residences in Newnes Junction in the later stages of mining, or make alternative arrangements in consultation with residents.

Current access to the Blue Mountains National Park is gained through the project area to the north of the Rocla sand quarry. This access will be maintained as part of the project development to enable local residents to continue to access the national park located to the north of the village. This access will be fenced to ensure that the safety of residents is maintained.

The development may have a negative affect on property values of Newnes Junction however, this effect would not extend to other residential areas not directly affected by the development such as Clarence Village. The actual effect is difficult to predict as buyers have differing requirements, based on a range of influences. It is not anticipated that prices will be significantly affected. However, to mitigate against loss of property value within Newnes Junction, the proponent is prepared to purchase affected residences for a negotiated value which assumes the kaolin mine was not

operational. The price would include relocation costs, however, should residences take up the offer but not wish to move from the area, they would also be welcome to continue to reside in Newnes Junction for a nominal rent.

Following the completion of mining activities in the area, the local residents in the area may use the site as a recreational resource. The use of the site will not preclude the use of Newnes Village as residential land.

Blue Mountains National Park

A buffer zone between the mining operation and the Blue Mountains National Park will be maintained and recreational activities in the Blue Mountains National Park will not be significantly affected.

Impacts will be limited to visual impacts from elevated vantage points in the National Park, however these are not easily accessible. The site can be viewed from the unformed track leading to Gooches Crater but not from the Crater formation itself. Other operations are currently visible from this track including Clarence Colliery Pit Top and fan installation, Kable and Rocla Quarries, access roads and railway formations. The buffer between the site and the adjacent park will provide intervening topography and vegetation that will assist in the screening the site from less elevated locations below the site but within the National Park.

Following the completion of mining, the site will be revegetated and visual impacts will be minimised. The site will have a different topography that may be evident from elevated vantage points within the National Park however, since it will be revegetated it will blend in with the surrounding native vegetation on the Clarence Colliery lease and the adjacent Blue Mountains National Park.

Industrial Activities in the Area

Industrial activities in the area will not be impacted detrimentally by the proposed development. No significant impacts on the local road networks will occur since the vast majority of transport from the site will be via rail.

The proposed mine will share the existing rail loop currently owned by Centennial Coal, however, Centennial will retain priority use of this rail loop and its operations will therefore not be impacted by the proposed operation.

Forestry Activities

The proposed activity will have no impact on forestry activities in the area. Existing activities will be able to continue without any alteration.

5.1.2 Future Land Use

Following the completion of mining in this area, and rehabilitation of the landscape, the future land capability of the site will be similar to that of the current site although the topography will be substantially different. The final land use will be determined in consultation with relevant community and authority bodies closer to mine closure

however, the site will be progressively rehabilitated and the final landform is likely to consist of a benched basin with a water body located at the base of the basin. Native vegetation to be progressively re-established on the benches will be capable of supporting native fauna.

Ultimately, the land could be used for recreational purposes or left as vacant vegetated land for conservation purposes. Other potential land uses could include using the water body as a wetland.

5.2 Topography

The proposed kaolin mine is located on the southwestern edge of the Newnes Plateau. The Newnes Plateau is the largest plateau in the Blue Mountains and one of the highest areas within the Sydney Basin. The surface of the plateau is gently to moderately inclined and covered mostly by particularly friable sandstones of the Narrabeen Group. The area is typically rugged with numerous cliffs that are nearly vertical in relief with deep gullies and elevated ridge tops. The elevation of the area ranges between ASL 900 m and 1,200 m. While pagoda rock formations are present on the edges of the Newnes Plateau, no such rock formations occur in the proposed development area.

The proposed site is located within the headwaters of the Wollangambe River, and the railway line to the west of the site is located at or near the catchment boundary. The proposed kaolin mine is located on an east facing hill slope draining into the Blue Mountains National Park.

At its centre, the proposed site has an elevation of about 1030 m ASL. Along the eastern boundary, the eastern corner of the site has an elevation of about 1000 m within a minor drainage gully that crosses the north eastern corner of the block. The topography rises further south to about 1040 m, and then falls away again to about 1020 m within an easterly drainage gully. Average elevation along the western boundary is uniform at about 1040 m.

The site of the proposed mine is crossed by two narrow ephemeral creek lines, draining southwest to northeast into the Wollangambe River (as shown in **Figure 5.1**). To the east of the site, the land falls away into the Wollangambe River within the Blue Mountains National Park. The catchment areas of these two ephemeral creeks are about 30 ha (northern drainage line) and 16 ha (southern drainage line). The northern drainage line flows into the Wollangambe River some 400 m from the site boundary and the southern drainage line flows into another tributary of the Wollangambe River before joining the river about 1.5 km from the site.

The two small ridges that cross the site are also oriented southwest to northeast, rising to the southwest.

5.2.1 Impacts of the Project on Topography

During the course of the proposed mining project, an open void will be progressively created within the landscape as mining proceeds from bench to bench as shown in the

mine plan figures. This void will drain into a low sump area within the central area of the void to prevent sediment-laden water from entering the adjacent Blue Mountains National Park and World Heritage Area.

At completion of mining the topography in the area will contain the final extent of this open cut void, some 450 m wide and 400 m long at its western edge and 650 m long at its eastern edge. The western side of the void will be some 50 m deep while the eastern edge will be 30 m deep. The void walls will be terraced, consisting of small, stepped sandstone benches some 3 m high resulting in an average slope of a approximately 50^0. These benches will be vegetated with native species and will be separated by near vertical sandstone slopes. The void will drain into the centre, and it is proposed to create a wetland in this central area with native species from area.

5.3 Land Capability

The land capability of an area can be classified as either urban or rural land capability. The urban land capability of an area refers to its ability to support a particular intensity of urban development without serious erosion and sedimentation problems occurring both during construction and over the longer term. The rural capability of an area refers to the ability of the land to sustain regular agricultural and pastoral production without permanent damage.

The Department of Land and Water Conservation (DLWC) has classified the land in this area according to its capability for agricultural use. The classification depends on a number of factors including slope and soil fertility. Eight capability classes are identified and a brief description of each of these is provided below.

Class I	Suitable for a wide variety of uses, with the highest potential for agriculture.
Class II	High potential for agricultural use, but with increasing limitation.
Class III	Generally fair to good agricultural land.
Class IV	Not generally suitable for cultivating on a regular basis; comprises the better classes of grazing land.
Class V	Not suitable for cultivation; production generally lower than for grazing land in Class IV.
Class VI	Comprises the least productive grazing land.
Class VII	Generally comprises areas of steep slopes with shallow soils; clearing of timber not recommended.
Class VIII	Land unusable for agricultural or pastoral purposes; preservation of the natural vegetation recommended.

Class VI land is found on side slopes with shallow soils, rocky outcrops and water logging. This land class could be suitable for grazing purposes although some of the land would not be very productive. Class VII and VIII land occurs on the steeper slopes in the area.

Under the DLWC's classification, the area affected by the development falls within the classification class VI. This land is therefore unsuitable for cultivation and has limited grazing capacity.

5.3.1 Land Capability Impacts

The proposed mining activities will not have a significant impact on land capability in the area. No impacts will occur on adjacent lands and the only impacts will be associated with the area immediately impacted by the mining operation.

The area contains a valuable state resource and the proposed development will involve extracting this resource prior to returning the area to native vegetation.

Following completion of mining, the area surrounding the open cut void will be rehabilitated and returned to native vegetation. The land capability of this area will not alter from current land capability although the area of the open cut void will be altered in terms of topography. The land is currently not suited for grazing or agriculture and is best vegetated. It is not proposed to use this area for grazing or other agricultural purposes after mining. Rather, the mined area will be rehabilitated with native species and will have a similar land capability to the current area.

5.4 Soils

5.4.1 Regional Soil Landscapes

A number of soil landscapes exist within the region, varying with the location of the soils within the topography and the location of the site in relation to geology and climate. The soils found within each of the regional landscapes that area found within the Newnes Plateau are described below. In addition, two other soil landscapes occur within the region and these are discussed in the next section dealing specifically with the site soil landscapes.

Newnes Plateau Soil Landscape – The Newnes Plateau soil landscape is common in the area, occurring on level to gently undulating wide crests and ridges on plateau surfaces of Triassic Sandstone. The local relief is up to 20 m and slopes are generally less than 10%. It occurs in areas where the elevation is usually greater than 1,000 m and infrequent rock outcrops are found in the landscape. The vegetation of this soil landscape consists of partially cleared low open-forest and woodland, as well as pine plantations.

The soils of this soil landscape are shallow (less than 50 cm) Sands and Lithosols which occur on crests associated with rock outcrops, or moderately deep (50 - 150 cm) Earthy Sands which occur on gently inclined sideslopes. Leached Sands are found near drainage depressions. Where shale / ironstone lenses are found there are moderately deep (>50 cm) Yellow Earths, while deep (>200 cm) Earthy Sands are found on deeply weathered friable sandstones. Minor sheet erosion and track erosion are common in these soils, and the soils are also particularly susceptible to erosion after bushfire or logging.

Mount Sinai Soil Landscape – This soil landscape occurs on narrow, rocky undulating crests and steep sideslopes with many rocky benches and pagoda rock formations within the Narrabeen Group Sandstones. The local relief is up to 130 m with slopes generally exceeding 30% and elevation from 900 - 1180 m. Rock outcrops are abundant, and open heath vegetation is often present in protected valleys.

The soils within this soil landscape are very shallow (up to 30 cm) stony sands, Lithosols on crests and sideslopes with rocky benches and shallow (<100 cm), Earthy Sands and occasional Yellow Earths on insides of benches and in deeply weathered joint lines of the Narrabeen Group sandstones. Shallow Earthy Sands exist in narrow incised valleys. The soils are extremely susceptible to water and wind erosion.

Warragamba Soil Landscape - This soil type is present in deeply incised valleys in the Narrabeen Group sandstones with minor cliffs. Local relief is from 80 - 130 m, slopes > 35% and elevation above 700 m. It supports uncleared tall open forest.

The soils are shallow to deep (50 - 150 cm) Lithosols on crests and ridges with Brown Earths and Red Podzolic Soils on upper slopes and Yellow Podzolic soils on the lower slopes. The soils have an extreme water hazard.

Deanes Creek Soil Landscape – this occurs predominantly on the central Newnes Plateau along linear drainage lines, including tributaries of Farmers Creek. It occurs in narrow, gently inclined elongated swamps with a local relief to 30 m and slopes from 0 - 5% at an elevation above 1000m.

The soils are moderately deep (<130 cm) waterlogged Humic Gleys and Grey Earths near and along the drainage lines, while moderately deep (30 - 100 cm) Peaty Sands and Earthy Sands occur on the swamp margins. These soils have permanently high water tables and are subject to period or permanent waterlogging.

5.4.2 Mine Site Soil Landscapes

Within the proposed mining lease area, two soil landscapes occur, the Medlow Bath and Wollangambe Soil Landscapes. The Medlow Bath soil landscape is found across the majority of the site on the higher and flatter slopes, while the Wollangambe Soil Landscape occurs on steeper slopes towards the eastern edge of EL4192.

Medlow Bath Soil Landscape - This soil type is common in the area and occurs extensively on both the Newnes Plateau and Blue Mountains Plateau. This landscape occurs on narrow crests and moderately inclined sideslopes formed on the Narrabeen Group sandstones. The landscape has a local relief of 20-50 m and slopes of 10-20%. It occurs at elevations generally greater than 850 m. It is characterised by localised rock outcrops and supports partially cleared open-forest and open-woodland.

Occasionally associated with rock outcrops, the soils on the crests are generally shallow (<40 cm) organic rich sands overlying either bedrock or well drained earthy sands (<80 cm deep). On the sideslopes there tends to be moderately deep (less than 100 cm) Yellow Earths and Earth Sands. Associated with the rock outcrops are shallow (less than 60 cm) Lithosols / Siliceous Sands. The soils are susceptible to erosion when the ground cover is disturbed.

Wollangambe Soil Landscape – this landscape consists of rounded convex crests and moderately to steeply inclined sideslopes on Narrabeen Group sandstones. Local relief is up to 100 m and slopes are usually <35%. The elevation is generally greater than 600 m and localised rock outcrops are common, including broken scarps and small rock ledges and cliffs.

On the crests soils are shallow (<30 cm) Siliceous Sands / Lithosols, Earthy Sands and Yellow Earths. On sideslopes soils are moderately deep (<100 cm) Earthy Sands, Yellow Earths and Red Earths. Shallow Siliceous Sands / Lithosol occur on small rock ledges and low broken scarps with a severe water erosion hazard.

The soils within EL4192 are very sandy, shallow and well drained, supporting open woodland vegetation. The sub-strata across the site is predominantly weathered, medium grained, cream to white sandstone. A characteristic of the Triassic Bank Wall Sandstone is that it forms a thin hardened surface crust, rarely exceeding a few millimetres, which mantles a friable, crumbly sandstone with an a clay matrix of kaolin. There are no outcrops of sandstone visible in the proposed mine area.

The site has few available soil resources, making the resources that are present very valuable for the rehabilitation of the site. Soils derived from the friable sandstone are low fertility sandy soils with a moderate to extreme erosion hazard. They consist of sandy yellow loams with a brown to yellowish sub soil, with often no distinct differentiation between topsoil and underlying weathered sandstone.

5.4.3 Potential Impacts and Impact Mitigation Strategies

The sandy soils on site are susceptible to erosion when the ground cover is disturbed. The active mining area will expose subsoils, sand and friable sandstone that will pose an erosion risk if left unprotected over significant periods of time.

A potential risk associated with the site is that of erosion of the final walls following mining. Left unprotected, erosion of the sand and clay material can result in gullying of the highwalls and sediment build up in the quarry pollution control ponds.

In order to protect the site from erosion, the rehabilitation works will be undertaken on each successive bench as they are created. The drainage system, as outlined in Section 3, has been designed to contain a 1 in 50 year, 72 hour storm event. This will be achieved with the construction of in-pit sumps and controlled discharge to the National Park of clean water that meets quality requirements.

A range of erosion and sedimentation controls will also be provided in the pit to minimise sediment-laden runoff from disturbed areas. To limit the risk of soil erosion and sediment loads in the waters, only the minimum area required for each successive mining area will be cleared and stripped of topsoil at any one time. This will reduce the area exposed at any one time and makes best use of the existing natural vegetation cover in preventing erosion and protecting water quality.

The proposed system will provide protection against uncontrolled runoff containing sediments from entering the waters of the Wollangambe and the Blue Mountains National Park.

As the mine proceeds, topsoil will be stripped and stockpiled from successive areas and stored prior to use in the rehabilitation activities. The useable component of the available topsoil ranges from the top 10 cm or more within or near drainage lines to less than 5 cm over the remaining area. The topsoil represents a highly valuable resource, containing weed free soil and seeds of species found on site, in addition to nutrients and organic matter that will assist in the revegetation of the area.

Topsoil will be stripped and placed topsoil stockpiles in areas adjacent to the initial mining areas. Topsoil stockpiles will be less than 2 m high with side slopes of 3:1 (H:V) and they will be of variable length. This will reduce the occurrence of anaerobic conditions that can occur in larger stockpiles. Should topsoil need to be stored for greater than 12 months, a cover crop will be sown to stabilise the surface as well as maintain biological activity within the soil.

When the outer edge of a bench is ready for rehabilitation, topsoil will be recovered from the stockpiles and placed on the 2 m strip that has been prepared for revegetation.

Only topsoil that has been derived from the site area will be used in the rehabilitation program. This will ensure that exotic weed species are not brought on to site in any other topsoil material, preventing the potential for weed infestation in the adjacent National Park due to the mining activities.

With an estimated 38,000 m^3 being generated, it is not anticipated that there will be a shortfall in topsoil as is usually the case in mining operations. This is because the final landuse of the site includes the creation of a water body or possibly a wetland at the base of the pit.

Native vegetation communities will then be established on the rehabilitation areas. As it becomes established, the vegetation will protect the soil resources of the pit edges and encourage infiltration of rain water and assist in the settlement of sediment.

The benched terraces will be developed to discharge water in a controlled fashion to the next bench. This will prevent gully erosion on the rehabilitated areas and sedimentation of runoff occurring. The terraced walls will have slopes equal to or greater than 80^0 to minimise the amount of rainfall on them and the erosion risk over the long term.

5.5 Visual Implications

The visual assessment was carried out on the basis of fieldwork and the study of the stereoscopic aerial photographs. Recommended amelioration treatments have been proposed to minimise the visual impacts associated with the works.

5.5.1 Visual Catchment

The visual catchment of the proposed mine site extends around the site to varying distances as shown on **Figure 5.2**. The best views of the site that are readily accessed are available from Bald Trig, located in the Newnes State Forest, some 2 km to the

north-west of the site. This site is the highest point in the area and has views of the National Park, Clarence Colliery, Kables Sands and the Rocla Quarry.

Views from the east are limited, since the area is covered by National Park with few permanent, formed tracks that would allow public access to gain views of the site. The site can be viewed from short sections of the unformed track leading to Gooches Crater, a feature known to bushwalkers, but cannot be seen from the feature itself. Views of Clarence Colliery pit top, the two existing quarries, access roads and railway infrastructure are also visible from this location.

Clear views of the kaolin mine would be available from rock pagodas located immediately opposite the site and on the edge of the National Park. Access to the top of these pagodas is extremely difficult and requires rock-climbing equipment. From this site, clear views of other industrial and residential activities on the western side of the National Park are available.

The site will be visible from residents at Newnes Junction, particularly on the northern side of the road. Although the quarry benches will not be visible in the early stages of the development, the removal of trees will be noticeable and may also open up views to Clarence Colliery.

5.5.2 Existing Landscape Elements

In general terms, the visual catchments in the study area contain a number of major landscape elements, including:

- slopes vegetated with native species of trees and shrubs including the site itself and the adjacent Blue Mountains National Park to the east;
- exposed high points and slopes from which the site may be readily seen (if the topography permits);
- industrial elements including coal mining infrastructure and reject emplacement to the north of the site and sand quarries to the south and north east of the site;
- dirt access roads to industrial sites and the Newnes Junction township;
- small village residences within the township of Newnes Junction; and
- transportation elements including road and rail infrastructure.

Each of the units found within the study landscape is briefly described to provide an indication of the existing landscape characteristics of the proposed kaolin mine.

Vegetated Slopes – many of the slopes within the area are vegetated with native species including much of the adjacent National park. The slopes have a low visual diversity due to the consistency of form and colour.

Exposed high points and slopes – exposed high points and slopes, including cliffs, pagodas, slot canyons and smaller escarpments characteristic of the sandstone

landscape of the Newnes Plateau occur adjacent to the Wollangambe River to the east of the site. These sites occur at high elevations within the landscape or in areas where vegetation is low or non existent. No such sites occur within the proposed mining lease.

Industrial elements – within the existing landscape a number of industrial developments occur, and visual elements associated with these developments include coal reject emplacement areas at Clarence Colliery, coal handling infrastructure and stockpiles, rail loading bin, conveyors and buildings, and sand quarries associated with Kables and Rocla.

Dirt roads – dirt roads providing access to the various industrial operations in the area (Kable Sands, Clarence Colliery and Rocla Quarry) and the Newnes Junction township are located to the west of the site.

Village residences – there are half a dozen dwellings in the village of Newnes Junction that are stand alone houses constructed primarily of wood and/or brick. Some of these dwellings are currently being renovated and there is the potential for other blocks to have dwellings constructed on them in the future. There is a buffer of some 200 m from the residences to the proposed mine site and until recently this entire area was vegetated with open woodland eucalyptus species. Recently some of this area has been cleared and a large dirt road has been constructed, providing access for public vehicles to the east. A minimum of 100 m of vegetation will remain between the residences and the ultimate pit limits.

Transportation elements – within the landscape, major roads and railways occur, creating linear visual elements within the landscape consisting of ribbons of clearing the transportation routes within them. The highway surface is asphalt and generally consists of 2 lanes. There are no views of the proposed mine site from the Bells Line of Road.

5.5.3 Assessment Criteria

In assessing the visual impacts of the proposed line, the visual catchment around the corridor was mapped according to the visual sensitivity of the areas within the catchment (refer **Figure 5.2**). The visual effect of the proposed mine site is the result of a complex combination of factors including:

- the existing visual environment;
- progressive and final visual characteristics of the proposed mine;
- distance;
- topography;
- vegetation cover;
- visual contrast generated;
- number of viewers;
- duration of view;
- angle of view; and
- visual sensitivity.

Existing visual elements - the nature of existing visual characteristics of the landscape is an important element in considering the impacts of the proposed mine.

Given the existing industrial elements within the landscape, including the sand quarries, which contrast with the dark green vegetation of the State Forests and National Park, the proposed mine will not introduce a new visual element into the landscape. The impacts of the proposed development are therefore related to increasing an existing visual element within the landscape.

Visually, the most significant impacts occur at sites closest to the proposed mine and from vantage points which directly overlook the site.

Where the site is not visible from surrounding areas there will be no visual impact. Where the mine is visible from elevated vantage points with uninterrupted views, the impacts will be greater, particularly, if these vantage points are frequented by residents or visitors to the area or users of the National Park.

Where areas of timber interrupt a view of the site, visual impacts will be less than if the screening effects of the timber were not present and such visual impacts diminish quickly with distance. Since clearing of the native vegetation will be required, the visual impacts become higher since the visual contrasts generated as a result are generally stark and highly noticeable over longer distances.

Other issues include the characteristics of backdrop surrounding the mine, and the degree to which the operation can be blended into the landscape. The prominence of the mine within the landscape also plays a role with the site being more visible from ridges located in the adjacent National Park than from sites closer to the mine.

Visual characteristics of the proposed mine - The characteristics of the physical components of the proposed kaolin mine, when compared with the existing landscape elements, contribute to the visual impact of the development.

The visual characteristics of the proposed mine will primarily consist of areas cleared of native vegetation with infrastructure and roads or mine benches located in them. The cleared areas will be light in colour, consisting of fresh sandstone which is white, yellow and light brown. In the early stages of the mine, cleared areas will be limited to the area of the access road and infrastructure and the initial mine stage. As the mine develops further, it will include larger cleared areas and rehabilitating vegetation at the edge of existing benches.

Distance - In terms of the visual impact, areas closest to a mine are generally subject to the highest degree of visual impact, where the mine is clearly visible from such areas.

In general terms, the further the mine is located from a point, the lower the visual impact will be. Within the visual catchment view lengths have been divided into foreground (0-0.5 km), within which the mine site would form a prominent feature in the landscape, middleground (0.5-2 km), within which the mine site can be readily seen but would not be as highly prominent, and background (2-5 km), within which

the mine site can be readily detected within the landscape but is not visually dominant.

Topography - The topography of the viewer will have a significant effect on the visual impact of the proposed mine activities.

High elevations and cleared outcrops - Where the mine is viewed from areas of high elevation or cleared outcrops, it can be silhouetted against the darker surrounding vegetation and will consequently have a high visual impact.

Mid-slopes - when the mine site is viewed from mid-slope areas, the visual impacts are generally lower, due to the view of the site being partially screened by intervening vegetation, making it more difficult to see.

Valley floors – where the site of the viewer is within a gully, it is unlikely that the mine site will be visible since it will be screened from view by the surrounding valley sides and ridges.

Vegetation cover - the amount and nature of existing vegetation in the intervening landscape is very important when determining the visual impact of a mine site. If the landscape between the mine and the viewer is cleared, the mine can be visible for considerable distances. The visual impacts will be highest close to the mine but will still lessen with distance.

Where scattered vegetation occurs, the impacts are generally lower, since scattered vegetation can screen the high contrast areas within the mine site.

Since clearing is required for the mine site in an area of existing vegetation, the visual impacts in terms of vegetative cover will be higher, as a result of the enlargement of a highly contrasting element (ie. cleared areas of exposed sandstone) into the landscape.

Number of viewers affected - when determining the visual impacts of a mine site the number of viewers is taken into consideration. Visual impacts are regarded as higher when a greater number of people are affected by the mine.

Duration of view - the duration of viewing also contributes to the visual impacts of a mine site. Static views (i.e. from residences, recreational areas and tourist lookouts) are regarded as more important than transitory views (i.e. from roads).

Angle of view - Visual impacts also depend on the locations and angles from which the mine is viewed. The greater proportion of given vista the mine site occupies the greater the impact. This is determined by the angle of view and the distance of the mine from the viewer.

Visual Sensitivity - visual sensitivity is a measure of the perceived visual impacts on the visual environment, or the ability of an area to absorb the visual impacts of a development.

5.5.4 Visual Assessment

The following categories of visual impact were established for the visual assessment, based on the assessment criteria outlined above.

- high visual impact;
- moderate visual impact;
- low visual impact; and
- negligible visual impact.

The categories above have been used in **Table 5.1** to determine the general visual impacts of the proposed mine site on the environment. The existing nature of the environment (including the topography and the presence of otherwise similar industrial elements within the landscape), the distance from which the mine is viewed and the vegetation cover of the area are clearly shown in the table. Other criteria considered for the assessment include the duration and angle of view (road views will be intermittent and of short duration), visual sensitivity and the number of viewers. While these criteria are not all shown in the tables, they were taken into consideration when determining the mapping of the visual impacts.

Table 5.1 - Visual Impacts of Proposed Mine Site

Landscape Element	Distance								
	Foreground Views 0-500 m			Mid ground Views 500-2000 m			Background Views 2000-5000 m		
From which mine will be Viewed	Intervening Vegetation			Intervening Vegetation			Intervening Vegetation		
	None	Scatt-ered	Dense	None	Scatt-ered	Dense	None	Scatt-ered	Dense
Exposed sites	H	M	n/a	H	M	n/a	L	L	n/a
Vegetated slopes	H	M	N	M	L	N	n/a	N	N
Industrial areas	M	L	N	L	L	N	N	N	N
Dirt Roads	H	M	L	M	L	N	L	L	N
Village residences	n/a	M	L	n/a	n/a	n/a	n/a	n/a	n/a
Main Transport elements	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

H - High visual impact
M - Moderate visual impact
L - Low visual impact
N - negligible visual impact
n/a – mine site not visible from such an area

5.5.5 Visual Impacts

The fact that the existing landscape is dominated by industrial elements to both the north and south of the site has been a major consideration in this visual assessment. Given the existing impacts of industrial developments in the landscape, the visual impacts of the proposed mine have been assessed on the basis of incremental impacts in areas from which existing developments are visible.

The impacts will include visual changes in the landscape associated with clearing of vegetation on site, exposure of the underlying sandstone material and construction of infrastructure required in the mining operations.

Specific visual impacts occurring in relation to the proposed mine are discussed below.

Newnes Junction Residences

In the early stages of mining, the operation will not be visible from any residential dwelling. However, in later stages of mining the reduced intervening timber will be noticed and in final stages of mining it may be possible for residences to view sections of the quarry faces. These views will be mitigated with additional tree planting within the buffer between the quarry and the residences as well as early rehabilitation of completed quarry faces, which will assist in screening the quarry faces.

Blue Mountains National Park

The mine will be located adjacent to the Blue Mountains National Park, with the topography sloping down from the mine site to the park boundary. A minimum 50 m buffer will be left on NKPL land. Only the operating pit will be fenced. An area will be dedicated for walking access from Newnes Junction to the National Park.

The area is currently vegetated with eucalypt woodland, and will therefore offer a substantial vegetation buffer. There are no permanent formed roads in the adjacent portion of the National Park, and public access to any areas within the park from which the mine may be viewed would be restricted to hikers.

The site can be viewed from the unformed track leading to Gooches Crater, a feature known to bushwalkers, but cannot be seen from the feature itself. Views of Clarence Colliery pit top, the two existing quarries, access roads and railway infrastructure are also visible from this location.

Clear views of the kaolin mine would be available from rock pagodas located immediately opposite the site and on the edge of the National Park. Access to the top of these pagodas is extremely difficult and requires rock-climbing equipment. From this site, clear views of other industrial and residential development on the western side of the National Park are available.

Adjacent Industrial Sites

The kaolin mine cannot be viewed easily from any existing industrial sites since each has a small but effective vegetative buffer. The mine could be partially viewed from the Clarence Colliery Coal Preparation Plant and Rail Loading Bin as well as elevated sites within the coal reject emplacement.

Key Transportation Routes

The mine cannot be viewed from Bells Line of Road or Main Western Railway line but could be viewed from the Clarence Rail Loop. The mine will not be visible from the proposed extension to the Zig Zag Railway which will link to Newnes Junction Station, nor from the station itself.

Dirt Roads

The mine will be visible from a section of the access road leading around the Clarence Rail Loop. Residents of Newnes Junction use this road that also passes the Clarence Colliery Pit Top, overlooks the coal stockpiling area and passes beneath the conveyor leading to the main rail-loading bin.

Vegetated Slopes

The proposed buffer between the mine and the National Park is considered sufficient to screen views from lower vantage points heading towards the site. Even at the boundary of the National Park looking west towards the mine, no views will be available due to the dense intervening vegetation.

5.5.6 Mitigation Measures

To reduce the visual impacts of the proposed mine site on the landscape, a number of techniques will be employed. These will include the following:

- maintaining a minimum 50 m vegetated buffer between the site and the adjacent National Park to minimise visual impacts of the mine site on the park areas immediately bordering the lease boundary;

- maintaining the remaining vegetation occurring between the residences in Newnes Junction and the proposed mine limits to screen the effects of the mine as much as possible;

- designing the mine with shallow benches some 3 m high and rehabilitating these benches with native vegetation as soon as practicable to screen the high wall with vegetation. Rehabilitating the edges of the shallow benches will improve views directly into the mine site from the National Park where the mine is visually prominent in the landscape;

- colouring the stockpile enclosure environmental green, to make it blend into the existing landscape as much as possible;

- colouring conveyor covers and other constructions on site environmental green where this is practical so that these elements blend into the existing landscape;

- minimising vegetation removal during construction and mine operation. This will ensure that visual impacts associated with the development are minimised; and

- infill vegetation planting to further screen the site from local residents if required.

5.5.7 Conclusion

The main visual impacts will occur from elevated vantage points surrounding the mine. This is the case for all industrial activities in the region, which can be invariably seen from higher, or overlooking vantage points. In this case however, views of the site can, with some difficulty, be seen from elevated points within the National Park. These locations are not easily accessible and when located, other industrial sites are equally visible. This is also true along other sections of the park boundary, which abut residential areas, agricultural land, industrial activities and major public infrastructure.

Views of the quarry from residential receptors in Newnes Junction will be mitigated by intervening vegetation that will be maintained during the quarry, and augmented as necessary. Although the project will result in some visual impacts, the net effects are considered acceptable.

5.6 Flora and Fauna

5.6.1 Introduction

The development of the proposed kaolin mine at Newnes will involve significant modification and disturbance to the vegetation and fauna habitat currently existing on the site. Consequently, this flora and fauna report has been prepared to provide a description of the flora and fauna on the site (particularly threatened species), identify sensitive areas in terms of their value for native species of conservation significance, and assist the relevant government authorities in their determination of the proposed mine. This report has been prepared in accordance with the requirements of the *Environmental Planning & Assessment Act 1979* and the *Threatened Species Conservation Act, 1995*.

5.6.2 Methods

General

The site of the proposed area to be disturbed by the mining operation is relatively small, covering an area of approximately 25.5 ha, and consequently extensive survey work was conducted. Survey work was carried out from 20 March to 24 March, 2000. Temperatures during this time were mild, ranging from 15°C during the night, to 25°C during the day.

Prior to the survey being conducted a wildfire swept across the Newnes Plateau in 1997. This fire resulted in extensive tracts of vegetation being severely burnt, including the proposed mine site.

An intense wildfire may be highly damaging to the wildlife. For example, it may take several decades for regrowth to reach a suitable development stage so that arboreal (tree-dwelling) mammals will recolonise the forest. However, fire is vital to many native species that depend on the disturbed landscapes, such as kangaroos, wallabies and wombats who prefer the nutritious new growth after the fire.

At the time of the survey regeneration was advancing, however potential habitat for many fauna species, both arboreal and ground dwelling was reduced. An assessment of potential habitat for native species is included in Section 5.6.5, with particular emphasis on potential faunal habitat once revegetation is at a more advanced stage.

Most dry sclerophyll eucalypts display a combination of vegetative and seed recovery and many are well adapted to fire survival, having thick bark and dormant buds. Few plants, if any, in dry sclerophyll forest cannot survive fire and many require fire for successful reproduction and regeneration.

The greatest flora species diversity occurs immediately after a fire when there is maximum availability of light and space, due to a greatly reduced canopy and shrub layer. Release of nutrients and stimulation of germination by the fire further encourage vegetative growth and establishment. Species diversity gradually declines through time with increased competition for essential elements as the vegetation grows. The post fire succession is largely determined by the species composition before the fire.

The flora survey conducted recorded all species present at the time. The vegetation is a dynamic system, constantly changing. The species diversity and abundance will change through time, and it is expected that there will be a gradual decline in diversity as time since the fire increases. The site was re-visited on 7 March 2003 to update the surveys and conduct further targeted searches for rare or threatened species that may have colonised the area since the initial surveys.

Flora

A number of flora surveys have been conducted previously in the Newnes area. These surveys were reviewed for information regarding the general floristic nature, and any species of conservation significance previously identified and considered likely to occur in the area. The basic vegetation units described in the previous surveys, particularly Benson and Keith (1990) were used as a basis for classifying vegetation in the current study.

Mapping of vegetation classes was done in a desktop study using aerial photographs at a scale of 1:25 000. These areas were then classified according to the vegetation units previously identified, and ground-truthed to verify the vegetation type. Vehicle-based transects were run along each of the existing exploration roads that traverse the area to ground-truth the vegetation units classified from the aerial photographs. Foot-based transects were then run through the vegetation to produce a species list (included as **Appendix D**). These incorporated both north and south-facing slopes, gullies and ridge tops. The level of past and current disturbance was also recorded.

All flora species found within 10 m of both the vehicle and foot-based transects were identified according to the recent nomenclature of Harden (1990, 19991, 1992 and 1993). Structural classification of the vegetation was in accordance with Specht (1988). The conservation significance of plant species was determined with reference to Briggs and Leigh (1996) on a national basis, and in accordance with the *Threatened Species Conservation Act, 1995* - Schedules 1 and 2.

Fauna

The survey found two habitat types within the study area - eucalypt forest and the "wet areas" which include a small swamp (approximately 500 m^2 in area) and two ephemeral creeks, both of which would remain dry outside of periods with substantial rainfall.

A sampling regime was then adopted that involved recording the presence of fauna species in a number of representative areas. Sampling methods covered a variety of topographical situations such as gullies, ridge tops and side slopes, which were surveyed for all faunal groups likely to be present. The location of each survey point is shown on **Figure 5.4**.

The structure, floristics and condition of the habitat, and an assessment of its value as potential habitat for native fauna was made and used in determining a valuable sampling site. Particular attention was given to the possible presence of resource features such as tree hollows, fallen logs, rock crevices, food and water sources which could be of potential significance for native fauna.

A review of previous fauna surveys in the area and recordings on the NSW National Parks and Wildlife Services database identified threatened species likely to inhabit the area. Targeted searches were conducted for each threatened species identified.

Sampling strategies specific to each faunal assemblage are summarised in the following sections, while a detailed description of fauna sampling methods is provided in **Appendix D**. In addition to the structured sampling regime, all incidental sightings of fauna, either direct or indirect were recorded.

A specific survey of the "wet areas" for frogs was conducted by Dr Arthur White during early May 2002. The focus of this survey was to determine the presence of the Giant Burrowing Frog, or potential habitat within the survey area.

Mammals

Trapping - Trapping of terrestrial mammals was conducted using both small and large hair tube and Elliott traps. A mixture of these traps was used to ensure a comprehensive sample was taken of the faunal assemblage.

Hair tube trapping is effective in sampling small and medium sized terrestrial mammals. They may be useful in detecting carnivorous and omnivorous species such as quolls, cats, dogs, foxes, bandicoots etc, in addition to herbivorous species such as potoroos, bettongs and other small macropods.

Elliott trapping was also employed to target small mammal species, and is capable of providing a more decisive identification of the species than hair tube trapping, where identification may be classed as definite, probable, or possible. Elliott trapping can also enable determination of the size, sex, condition and health of the animal.

Both of these techniques were employed to cover all possible terrestrial mammal groups, as each method has particular advantages over the other, including:

- hair tube traps do not result in the physical capture and containment of specimens, thereby reducing stress and the potential for harm to the animal;
- hair tube traps are capable of sampling larger species such as dogs (including dingos) which are too large to be caught in Elliott traps;
- hair tube traps are less labour intensive and can therefore allow a more extensive sample to be conducted;
- Elliott traps allow for a positive identification of the species, whereas samples obtained from hair tube traps may be categorised as either definite, probable, or possible; and
- Elliott traps allow an evaluation of the size and health of the specimen and an indication as such of the population, as well as allow determination of the sex of specimens.

Traps were laid within the vegetation along tracks numbered 2 and 6 (see **Figure 5.4**), at intervals of approximately 15 m. These two lines were chosen for the survey as they were representative of the entire study area, and encompassed the wet area and creeklines previously referred to. Both trap mines traversed north and south facing slopes, ridge tops and gullies. The small and large sized traps were placed in a regular pattern.

Spotlighting - Vehicle based spotlighting was conducted during the periods of mammal trapping to target nocturnal arboreal species including both birds and mammals. Spotlighting was conducted for approximately 3 hours each night, with the existing tracks traversing the area being sampled.

Call Back Tapes - Call back tapes were played for a number of rare and threatened mammal and nocturnal bird species previously identified from the Newnes area. Calls of each species were broadcast using a Compact Disc walkman with attached speakers for three minutes, followed by two minutes of silence to detect the presence of the species in the area by a return call. Call back tapes were played in conjunction with spotlighting.

Incidental Sightings - All incidental sightings of mammals while conducting fieldwork were recorded. These included direct visual sightings and indirect evidence such as scats, diggings and burrows etc.

Avifauna

Three sights were selected within the area and surveyed for avifauna present. Bird surveys were conducted within the first 3 hours of sunrise and included the visual and aural detection of birds. Bird surveys lasted for 20 minutes at each site. Specific bird surveys were supplemented by incidental observations. Nocturnal bird species were surveyed through spotlighting and the use of specific call back tapes, as previously described.

Herpetofauna

Three sights were selected within the area and active searches for herpetofauna conducted during the warmest part of the day around noon. Searches lasted for 20 minutes at each site and involved inspection of tracks, large rocks and leaf litter, as well as lifting and rolling of logs and rocks. Specific surveys were supplemented by incidental observation.

5.6.3 Previous Surveys

Previous flora and fauna surveys have been conducted within the Newnes area. The results of these are summarised below.

Flora

Vegetation of the Wallerawang 1:100,000 map sheet was mapped by Benson in 1984, in which 18 vegetation units were described. Based on this vegetation mapping, the area proposed for the Kaolin mine is covered by open forest dominated by *Eucalyptus sieberi* and *Eucalyptus piperita*, referred to as Silvertop Ash - Sydney Peppermint Forest.

Other associated canopy trees include *Eucalyptus* radiata (Narrow-leaved Peppermint), *Eucalyptus mannifera* (Mottled Gum), and *Eucalyptus sclerophylla* (scribbly Gum) on exposed sites. Both *E. mannifera* and *E. schlerophylla* may form pure stands in poorly drained or exposed sites respectively. *Eucalyptus blaxlandii* may also be present on the more sheltered sites, and *Eucalyptus oblonga* on poorer, more exposed sites (Benson, 1984).

This forest type is found predominantly on Sandstone plateaux and ridges with an elevation between 800 and 1050 m. It is characteristic of the Blue Mountains vegetation between Wentworth Falls and Bell. This vegetation is found overlying Narrabeen Group geology, and will intergrade with open forest dominated by *Eucalyptus fastigata* and *Eucalyptus dalrympleana* in valleys (Benson, 1984).

A later survey was conducted for Corkery and Co. (1993) over the Clarence Colliery pit top, which is located immediately to the north of the proposed kaolin mine. The survey of the pit top classified the vegetation as dry sclerophyll woodland / open forest. No species identified were listed as rare or endangered, however a few plants of *Olearia quercifolia* were recorded approximately 200 m north of the northern boundary of the proposed kaolin mine.

A flora species list has been compiled as Appendix D2 listing all species previously identified in the area.

Fauna

Fauna studies have been conducted previously in the Newnes Plateau area. Species identified in earlier studies are listed in Appendix D3.

A fauna survey conducted in 1993 by Corkery & Co. identified few species in the area of the Clarence Colliery pit top. The Red-necked Wallaby was the only macropod observed in the Pit Top and arboreal mammals were sparse and limited to three Greater Gliders within the rail loop area, and a single observation of a Ring-tailed Possum in the south-west corner of the Pit Top. The Southern Bush Rat was trapped in a small gully within the Rail Loop, and evidence of Echidnas and Common Wombat were evident. A number of bird species were recorded, and only one reptile species, the Copper-tailed skink.

A fauna survey was conducted by IEC (1999) on the Newnes Plateau, to the north, west and east of the proposed kaolin mine. This survey recorded a total of 13 mammal species, 23 bird and 3 reptile species.

The only survey to detect any species of conservation significance was that carried out by IEC in 1999, when the Yellow-bellied Glider *Petaurus australis* and the Powerful Owl *Ninox strenua* responded to call back tapes. Both species were found associated with Newnes Plateau Woodland on the Newnes Plateau, approximately 3.3 km north-west of the proposed Kaolin mine site. This vegetation is dominated by *Eucalyptus blaxlandii, Eucalyptus dalrympleana, Eucalyptus dives, Eucalyptus oreades,* and *Eucalyptus sieberi.*

5.6.4 Flora Survey Results

Vegetation Communities

Only one flora community was identified within the study area. This was the Silvertop Ash - Sydney Peppermint Forest, as described by Benson (1984). This vegetation is dominated mainly by the Sydney Peppermint (*Eucalyptus piperita*), with the Silvertop Ash (*Eucalyptus sieberi*) being less abundant at this site.

Along the northwestern corner of the study area *E. piperita* is replaced by the scribbly gum (*Eucalyptus sclerophylla*), where it is the dominant canopy species, as shown in **Figure 5.3**. The almost pure stands of *E. sclerophylla* occur along the north-facing slope at the top of the ridge near the Clarence Colliery boundary, which is a fairly exposed site. Understorey species do not show a change with the replacement of *E. piperita* by *E. sclerophylla*, and this is described as a pattern which occurs within the Silvertop Ash - Sydney Peppermint Forest (Benson, 1984), and is therefore not considered as a separate vegetation unit.

Vegetation on the proposed Kaolin mine site shows signs of severe devastation due to the 1997 wildfire that swept across the Newnes Plateau. The degree of disturbance caused by the fire varies across the site, and consequently the subsequent regeneration of the canopy varies. Regeneration is through epicormic regrowth, and is supported by abundant seedling development of the upper canopy species.

A fairly low diversity was found in the lower strata, with only a few species dominating. This would be likely to be due to the fire. Weed species were not common on the site. **Table 5.2** shows the dominant species in each of the strata.

Table 5.2 - Dominant Species of the Silvertop Ash-Sydney Peppermint Forest

Strata	Species	
Upper Canopy	*Eucalyptus piperita*	Sydney Peppermint
	Eucalyptus sieberi	Silvertop Ash
	Eucalyptus sclerophylla	Scribbly Gum
Shrub Layer	*Lomatia silaifolia*	Crinkle Bush
	Daviesia latifolia	Broad-leaf Bitter-pea
	Platysace minearifolia	Narrow-leaf Platysace
	Banksia spinulosa	Hairpin Banksia
	Boronia microphylla	Small-leaved Boronia
	Acacia terminalis	
	Epacris pulchella	
	Telopea spesiosissima	Waratah
Ground Layer	*Mirbelia platylobioides*	
	Phyllota squarrosa	
	Dampiera stricta	Blue Dampiera
	Goodenia dimorhpa var. *dimorpha*	
	Grevillea laurifolia	
	Patersonia glabrata	Leafy Purple-flag

Vegetation of Conservation Significance

Vegetation of conservation significance is defined as all vegetation communities, as well as individual flora species and isolated populations whose short or long-term survival is threatened due to restricted distributions or habitat requirements, significant population or distributional range declines, and where threats to their survival still prevail.

Within New South Wales species of conservation significance are listed under Schedules 1 (Endangered) and 2 (Vulnerable) of the *Threatened Species Conservation Act, 1995* (TSC Act). Species of conservation significance at a national level are those listed as Rare or Threatened Plants (ROTAP species) by Briggs and Leigh (1996), and those listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) as species of National Environmental Significance (NES).

The Atlas of NSW Wildlife is a database maintained by the NSW National Parks and Wildlife Service (NPWS) with information on the flora and fauna of NSW, as recorded by the Service and other organisations. A similar database exists at a national level, and is maintained by Environment Australia.

Threatened Flora Species Recorded

Targeted searches for flora species of conservation concern likely to be present did not reveal the presence of any such species.

Threatened Flora Species known from the Surrounding Area

Table 5.3 lists flora species of conservation significance previously identified from the area. This list has been compiled from a number of sources, including Vegetation

of the Wallerawang 1:100 000 Map Sheet by Benson and Keith (1990), the Atlas of NSW Wildlife maintained by the National Parks & Wildlife Service, the Environment Australia database, and the previous flora surveys conducted by Corkery and Co (1993) and IEC (1999).

Table 5.3 - Flora Species of Conservation Significance Recorded in Region

Scientific Name	Potential Habitat	Conservation Status
Acacia bynoeana	Heath / Woodland	V
Acacia flocktoniae	Forest	N(v)
Almaleea incurvata	Swamp	E
Apatophyllum constablei	Forest	E
Boronia deanei	Swamp	V
Caladenia tessellata	Widespread	N(v)
Derwentia blakelyi	Forest	V
Diuris aequalis	Forest	N(v)
Eucalyptus pulverulenta	Rocky outcrops	N(v)
Haloragodendron lucasii	Forest / Woodland	E
Persoonia acerosa	Forest	V
Persoonia marginata	Forest	V
Prostanthera cryptandroides	Forest	V
Pultenaea glabra	Forest / Scrub	N(v)
Thesium australe	Widespread	N(v)

V Listed as vulnerable under Schedule 2 of the *Threatened Species Conservation Act 1995*.
N Listed under the EPBC Act as (e) endangered or (v) vulnerable.
E1 Listed as endangered under Schedule 1-part 1 of the *Threatened Species Conservation Act 1995*.

Acacia bynoeana - is a low bushy shrub inhabiting heath and woodland with scattered occurrences from the coast to the mountains. Within the area the species has been recorded from Hazelbrook to Bell, Wheelbarrow Ridge and Lower Portland (Fairley and Moore, 1989). It considered to be adequately reserved, being recorded in Blue Mountains and Royal National Parks, Agnes Banks Nature Reserve and Castlereagh State Forest (Briggs and Leigh, 1996).

Potential habitat for the species exists on the site of the proposed kaolin mine site, however was not detected during the current survey.

Acacia flocktoniae - *Acacia flocktoniae* is a slender shrub up to 3 m in height. In inhabits dry schlerophyl forests and is known to occur in the Blue Mountains.

According to Briggs and Leigh, the species is considered as vulnerable, has a known geographic distribution within Australia of less than 100 km, and is present in Blue Mountains National Park.

Suitable habitat for the species exists on the proposed kaolin site, however the species was not observed during the field surveys.

Almaleea incurvata - is an erect shrub up to 1 m high occupying wet areas within the Blue Mountains (Fairley and Moore, 1989) and is present within Blue Mountains National Park (Briggs and Leigh, 1996).

Potential habitat for this species within the survey area would be limited to the wet area and two ephemeral creeklines. However, these sites are not permanently wet, and may only provide intermittent habitat for this species, which was not recorded during the survey.

Apatophyllum constablei - is a small spreading shrub up to 50 cm high, found within sandstone forest (Carolin and Tindale, 1994). The species has been recorded at Glen Davis and is represented in Wollemi National Park (Briggs and Leigh, 1996).

Potential habitat for the species exists on the site of the proposed kaolin mine site, however was not detected during the current survey.

Boronia deanei - *Boronia deanei* is an erect shrub up to 1 m tall, growing on swampy ground in heath and shrubland (Fairley and Moore, 1989). The species is regarded as Vulnerable and listed under Schedule 2 of the TSC Act. *B. deanei* has a distribution in Australia greater than 100 km. It is considered to be adequately reserved with over 1000 plants within a conservation area, including Budderoo National Park, Kanangra-Boyd National Park, Morton National Park and Nalbaugh National Park (Briggs and Leigh, 1996).

Potential habitat for this species is not present within the study area, as there are no swampy areas or heath. Potential habitat is likely to exist elsewhere on the Newnes Plateau.

Caladenia tessellata - *Caladenia tessellata* is a low growing shrub occupying a variety of habitats. The species is regarded as vulnerable, with a distribution in Australia greater than 100 km. The species is not known from any conservation areas.

While the species was not recorded during the flora surveys, suitable habitat does exist within the study area.

Derwentia blakelyi - *Derwentia blakelyi* is a small, slender shrub up to 40 cm. It is known to inhabit roadside margins and sandy slopes above swamps. Known occurrences of the species are from the Newnes Plateau, above a swamp.

Derwentia blakelyi has been assigned a Risk Code of 2K under ROTAP. This indicates that the species has a distribution of less than 100 km within Australia, however has only recently been listed as vulnerable under the TSC Act.

Suitable habitat for *D. blakelyi* does not exist within the proposed development area.

Diuris aequalis - is a plant up to 50 cm high occupying open forest. Recordings of the species are from the Blue Mountains and the Cumberland Plain.

D. aequalis is considered by Briggs and Leigh as vulnerable and has a geographical distribution within Australia greater than 100 km. The species is known from Blue Mountains National Park and Kanangra-Boyd National Park.

While the species was not recorded during the flora surveys, suitable habitat does exist within the study area.

Eucalyptus pulverulenta is usually a straggly shrub and occurs in a restricted area in the Blue Mountains and some hundreds of kilometres away in the southern tablelands, suggesting that it was once much more widespread than now. Suitable habitat for the species is rocky outcrops on hillsides.

According to Briggs and Leigh *E. pulverulenta* is listed as vulnerable with a geographical distribution within Australia greater than 100 km. It is not known from any conservation areas.

Suitable habitat for this species does not exist within the proposed development area.

Haloragodendron lucasii - is a shrub up to 1 m tall, once believed to be extinct. The species grows in sheltered gullies, often at the base of rock faces with a fern understorey and has been recorded at the Wollangambe gorges and Davidson Park (St Ives) (Fairley and Moore, 1989). The species is adequately reserved in Blue Mountains National Park (Briggs and Leigh, 1996).

Suitable habitat for this species does not exist on the site of the proposed mine, with no sheltered gullies or rock facies present.

Persoonia acerosa - is a small spreading shrub growing in dry open forest, woodland and heath on sandy soils of the Blue Mountains (Fairley and Moore, 1989). The species is represented in the Blue Mountains National Park (Briggs and Leigh, 1996).

Suitable habitat for this species is present on the site of the proposed mine, supporting forest on sandy soils, however this species was not observed during the surveys.

Persoonia marginata - is a branching shrub up to 60 cm high occupying dry sclerophyll forest on sandy soils around Capertee (Caromine and Tindale, 1994). The species is not known to be represented within any conservation areas (Briggs and Leigh, 1996).

Suitable habitat for this species is present on the site of the proposed mine, supporting forest on sandy soils, however this species was not observed during the surveys.

Prostanthera cryptandroides - is a small shrub up to 60 cm and is regarded as endangered because of its restricted distribution. It occupies forested slopes and gullies in rocky areas, especially at the base of scree slopes in the Glen Davis - Capertee area, extending to Goulburn River valley (Fairley and Moore, 1989). The species is represented in the Wollemi and Blue Mountains National Parks (Briggs and Leigh, 1996).

Potential habitat for this species is not present at the site of the proposed kaolin mine.

Pultenaea glabra is found in small scattered populations of open forest and scrub, on protected slopes. It occurs in the Blue Mountains between Wentworth Falls and Katoomba.

According to Briggs and Leigh it has a geographical distribution within Australia of less than 100 km. Over 1000 plants are present with conservation areas such as the Blue Mountains National Park and Wollemi National Park.

Suitable habitat for this species is not present within the study area.

Thesium australe - is a perennial herb approximately 30 cm high and occurs in a variety of habitats. According to Briggs and Leigh the species has a geographical range of over 100 km within Australia and less than 1000 plants are known to occur within conservation areas. The species is also known to occur overseas. It is recorded in Mount Greville National Park, Bullen Range Nature Reserve, Kosciusko National Park, Namadgi National Park, Crowdy Bay National Park, Hat Head National Park, Kattang Nature Reserve, and Cobberas-Tingaringy National Park.

While the species was not recorded during the flora surveys, suitable habitat may exist within the study area.

None of these species were detected within the study area despite targeted searches. It must be acknowledged however, that potential habitat for those threatened species that normally inhabit open forest exists at the site.

5.6.5 Fauna Survey

Potential Habitat

Two potential habitat types have been identified within the study boundary. These are the Silvertop Ash - Sydney Peppermint Forest which covers all of the site, and within the forest are "wet areas", which include a small swamp (approximately 500 m^2 in area) and two ephemeral creeks, both of which would remain dry outside of periods with substantial rainfall.

Forest and woodland communities provide potential habitat areas for a range of fauna species. The woodland provides habitat for a variety of passerine birds, including nest sites and material, foraging substrates and a range of food resources. Tree hollows, limbs and trunks of mature trees may also provide suitable shelter for other fauna including arboreal mammals, microchiropteran bats and reptiles.

This vegetation was burnt during the 1997 wildfire, and consequently there are some areas where the canopy is diminished in size and structure, therefore the potential to provide habitat for arboreal species is reduced. Furthermore, few tree hollows are present in the area, which also reduces the value of this habitat for arboreal mammals.

Habitat value will slowly increase as the canopy structure becomes more developed, and will be able to support a greater diversity and abundance of species. Species likely to recolonise the area will include numerous birds, possums and gliders.

The understorey of the Silvertop Ash - Sydney Peppermint Forest is dominated by seedlings of the canopy species, which is usually of low habitat value for ground dwelling mammals and bird species. This is supplemented by a medium density of shrubs and grasses generally of a height up to 2 m, providing substantial habitat for

small mammals and birds. The understorey has shown significant growth since the initial survey, providing additional potential fauna habitat.

As previously mentioned, two ephemeral creeks traverse the area, which in depressions in the topography from "wet areas". Given the location of the site high within the catchment, these creeks and wet areas provide only transient and short-term habitat, and therefore would not be capable of supporting faunal assemblages normally found associated with permanent water courses. Consequently, these areas have not been regarded as distinct areas of potential habitat and therefore were not specifically sampled. These areas were however, surveyed as part of the normal open forest habitat.

Fauna Species Identified

Mammals

Only two mammal species were detected during the survey. A total of Eight Ringtail Possums (*Pseudocheirus peregrinus*) were observed during spotlighting, and one Eastern Grey Kangaroo (*Macropus giganteus*) was observed moving through the forest around midday. Both the ringtail possum and eastern grey kangaroo are species that are commonly encountered and present in abundance.

No other mammals were detected during trapping, spotlighting, through call back tapes, or directly or indirectly observed through scats, scratches or tracks. Furthermore, there was no indication of any feral animals inhabiting the area. Previous surveys in the Newnes Plateau have detected the presence of rabbits, feral pigs and wild dogs, however these species appeared to be absent from the study area at the time of the survey.

Avifauna

A total of 16 bird species were identified during the survey as shown in **Table 5.4**. All of these were species that are normally found associated with open forests, and all were native to Australia. No nocturnal species were detected during the study.

The species present are representative of a variety of guilds including insectivores (eg thornbills, scrubwrens, fantails and fairy-wrens), pollinators (eg honeyeaters), and scavengers (eg Currawong). No ground dwelling birds were detected, and is likely to be due to the absence of a dense understorey that would normally provide shelter.

Table 5.4 - Avifauna Recorded in the Study Area

Scientific Name	Common Name	Tally
Acanthiza reguloides	Buff-rumped Thornbill	3
Anthochaera chrysoptera	Little Wattle Bird	1
Corcorax melanorhamphos	White-winged Chough	3
Cormobates leucophaeus	White-throated Treecreeper	6
Dacelo novaeguineae	Laughing Kookaburra	3
Eopsaltria australis	Eastern Yellow Robin	3
Lichenostomus leucotis	White-eared Honeyeater	1
Malurus lamberti	Variegated Fairy-wren	5
Manorina melanocephala	Noisy Minor	5

Table 5.4 - Avifauna Recorded in the Study Area

Scientific Name	Common Name	Tally
Manorina melanophrys	Bellbird	3
Platycercus elegans	Crimson Rosella	8
Platycercus eximius	Eastern Rosella	2
Rhipidura fuliginosa	Grey Fantail	1
Sericornis frontalis	White-browed Scrubwren	4
Strepera graculina	Pied Currawong	10
Zosterops lateralis	Silvereye	3

Herpetofauna

Reptile and amphibian species did not appear to be abundant during the survey. Only one frog species, the Common Eastern Froglet (*Ranidella signifera*) was found inhabiting the wet area, and was actively calling both at night and during the day. The only reptile species observed was the Dark-flecked Garden Skink (*Lampropholis delicata*).

A survey conducted by Biosphere Environmental Consultants Pty Ltd in May 2002 for the Giant Burrowing Frog, Heleioporus australiacus, or potential habitat found that from the assessment of habitat, it is very unlikely that Giant Burrowing Frogs would be able to survive on the project site or in the immediate local area. This report is included in Appendix D.

Species of Conservation Significance

Fauna species of conservation significance within New South Wales are those species listed under Schedule 1 and Schedule 2 of the *Threatened Species Conservation Act, 1995,* and as such are protected under the act. Threatened species are those species that have restricted distributions, habitats and / or low population numbers, and are subject to threats that could potentially result in a further decline of the species.

Threatened Fauna Species Recorded

Targeted searches for fauna species of conservation concern likely to be present did not reveal the presence of any such species.

Threatened Fauna Species known from the Surrounding Area

A number of species of conservation significance have been detected in the vicinity of the survey area through previous fauna surveys, some of which are listed on the Atlas of NSW Wildlife maintained by the National Parks & Wildlife Service. These species are listed in **Table 5.5**.

Table 5.5 - Rare or Threatened Fauna Species

Scientific Name	Common Name	Potentially Present	Conservation Status
Dasyurus maculatus	Spotted-tailed Tiger Quoll	NPWS, 1993	V
Eulamprus leuraensis	Blue Mountains Water Skink	NPWS, 1993	E1
Hoplocephalus bungaroides	Broad Headed Snake	1993	E1
Ninox strenua	Powerful Owl	NPWS, 1999	V

Table 5.5 - Rare or Threatened Fauna Species

Scientific Name	Common Name	Potentially Present	Conservation Status
Paralucia spinifera	Bathurst Copper Butterfly	NPWS	E1
Petaurus australis	Yellow-bellied Glider	1999	V
Petaurus norfolcencis	Squirrel Glider	1993	V
Phascolarctos cinereus	Koala	NPWS, 1993	V

V	Listed as vulnerable under Schedule 2 of the *Threatened Species Conservation Act 1995*.
E1	Listed as endangered under Schedule 1-part 1 of the *Threatened Species Conservation Act 1995*.
NPWS	Listed as present in the area under the Atlas of NSW Wildlife.
1993	Identified in the 1993 fauna survey as likely to occur in the area.
1999	Identified in the 1999 fauna survey on the Newnes Plateau area.

None of these species were detected within the study area, despite specific searches. The likelihood of each of these species inhabiting the proposed Kaolin mine site is discussed briefly in the following sections.

Spotted-tailed Tiger Quoll - The Spotted-tailed Tiger Quoll (*Dasyurus maculatus*) is a nocturnal carnivore, feeding on a variety of prey ranging from insects to small wallabies. Medium-sized mammals comprise about two thirds of the diet, as well as birds, small animals and carrion from Dingo or wild Dog kills.

This species is recorded from a wide range of habitats, including rainforest, open forest, woodland, coastal heathland and inland riparian forest. It occurs from the coast to the snowline and inland to the western plains in Red Gum forest along the Murray River. Den sites may include rock crevices, caves and hollow logs. The greatest threat to the species is loss of habitat through clearing, poisoning and trapping, shooting where it is considered a pest, and competition with introduced species such as the fox and feral cat.

The Spotted-tailed Tiger Quoll is known to inhabit woodlands such as that present on the study area, however suitable den sites are absent, reducing the likelihood of the species being present on the site. An unconfirmed sighting of the Spotted-tailed Tiger Quoll has been reported by a resident in the Newnes Junction township, however its presence was not detected in the current survey. The Spotted-tailed Tiger Quoll may be an intermittent visitor through the area, opportunistically searching for food.

Blue Mountains Water Skink - The Blue Mountains Water Skink (*Eulamprus leuraensis*) is a dark brown to black shining skink with golden to white stripes and a yellow underside. The skink grows up to a body length of 75 mm, however the average length is 60 mm. The Blue Mountains Water Skink is only found in the upper Blue Mountains, and on the Newnes Plateau where it inhabits wet heath or hanging swamps. It is also known to inhabit artificial wet areas such as water storages and industrial discharge points.

Little is known about the biology or complete distribution of the species, however a population is present in swamps within the Blue Mountains National Park. Permanent wet areas are not present in the study area, given its location at the top of the catchment. Suitable habitat is therefore not present and it is considered highly unlikely that the Blue Mountains Water Skink inhabits the area proposed for the Kaolin mine.

Broad Headed Snake - The Broad Headed Snake (*Hoplocephalus bungaroides*) is a nocturnal species feeding predominantly on small lizards. It inhabits sandstone ridges and rock crevices.

Suitable habitat for this species does not occur within the area proposed for the Kaolin mine, and it is therefore considered highly unlikely that the Broad Headed Snake inhabits the area.

Powerful Owl - The preferred habitat of the Powerful Owl is tall moist open eucalypt forests in hilly terrain, but is also known to occur in a wider range of forest types such as drier forest and woodland and urban bushland. Roosting may be in a variety of places including dense canopy and substorey trees within rainforest and open forest, often in gullies, and canopy trees in woodland. Within coastal areas of New South Wales common roost sites are Red Turpentine (*Syncarpia glomulifera*) in tall open forest and Black She-oak (*Allocasuarina littoralis*) in open forest with dense crowns.

The Powerful Owl is distributed along the coast ad ranges of eastern Australia from near Rockhampton in Queensland, south throughout eastern New South Wales and Victoria. It mainly occurs on the coastal side of the Great Dividing Range.

Estimates of the home range vary from 400-600 ha per family group to 800-1000 ha. The diet of the Powerful Owl consists mainly of arboreal mammals such as the Common Ringtail Possum, the Greater Glider, and the Sugar Glider, however this will vary with prey availability.

Suitable habitat exists for this species, however it is patchy where the canopy remains sparse after the wildfire. Based on the findings of this fauna survey, few prey species exist for the Powerful Owl, and it is therefore unlikely that the species would depend on the area.

Bathurst Copper Butterfly - The Bathurst Copper Butterfly (*Paralucia spinifera*) is usually found associated with patches of Blackthorn (*Bursaria spinosa* var. *spinosa*) at an altitude above 900 m. A few small Blackthorn shrubs were identified along the central ridge on the study site during the initial survey. At this time, it was considered that this may provide potential habitat for the Bathurst Copper Butterfly.

However, the follow-up survey failed to find any Blackthorn plants, despite targeted searches for the species. It is therefore currently considered unlikely that the Bathurst Copper Butterfly relies on habitat within the area of the proposed development.

The loss of the Blackthorn that was found in the original surveys is likely attributed to the individuals being out-competed by other species. No evidence of additional physical disturbance was found at the site, and it must therefore be assumed that the Blackthorn has been lost due to natural processes.

Yellow-bellied Glider - The Yellow-bellied Glider (*Petaurus australis*) occurs patchily in tall, mature wet eucalypt forests at a density of 0.05 - 0.14 individuals per hectare. It feeds primarily on plants and insect exudates (sap, nectar, honeydew and manna), and in Queensland eucalypt sap is consumed throughout the year. When

available, Eucalypt blossom provides valuable food. Sap is obtained by biting out small patches of bark of the trunk or main branches of a eucalypt. When this flow dries up, a new excision is made, and heavily used trees become very scarred after a few years.

During the day the glider rests in a den in the hollow branches of trees, usually smooth-barked eucalypts. It emerges at night to forage and may travel up to 2 km from the den. The home range is of the order of 35 ha. Suitable den habitats does not exist within the area and it is therefore considered unlikely that the Yellow-bellied Glider is present.

Squirrel Glider - The Squirrel Glider (*Petaurus norfolcensis*) inhabits dry sclerophyll forest and woodland in south-eastern Australia, however is absent from the dense coastal ranges. The glider feeds on insects, the gum produced by acacias, the sap of some eucalypts, nectar and pollen. Nests are made in a bowl-shaped nest mined with leaves within a tree hollow. Tree hollows appear to be absent or scarce within the study area and it is therefore considered unlikely that the Squirrel Glider inhabits the area.

Koala - The Koala (*Phascolarctos cinereus*) occupies a vast fragmented range throughout eastern Australia. Cold winter temperatures prevent it from inhabiting backbone of the Great Dividing Range, however it is widely distributed on either side. To the south and east it is most abundant in the forest remnants and foothills and coastal plains. To the west it extends well inland, following the River Red Gum forests along the rivers and waterways.

The Koala feeds selectively on a few species of eucalypts, with variations in the preferred trees throughout the range. In the south the Koala feeds preferentially on Manna Gum (*Eucalyptus viminalis*), Swamp Gum (*Eucalyptus ovata*) and Blue Gum (*Eucalyptus globulus*), while Red Gums (*Eucalyptus camaldulensis* and *Eucalyptus tereticornis*), Tallowwood (*Eucalyptus microcorys*) and Grey Gum (*Eucalyptus punctata*) are important in the north.

Preferred food species of the Koala are not present in the area proposed for the Kaolin mine and it is therefore considered highly unlikely that the Koala is present in the area.

SEPP 44 - Koala Habitat Protection

State Environmental Planning Policy No. 44 - Koala Habitat Protection was developed in 1995 to coordinate a state-wide approach to the protection of Koala populations, primarily through the preservation of their habitat. SEPP 44 applies to the Greater Lithgow Local Government Area and as such, Council must consider SEPP 44 in its determination of all development applications.

In consideration of SEPP 44, searches were undertaken to identify any areas of:

- "Potential Koala Habitat" where native trees as listed under Schedule 2 of the policy constitute at least 15 % of the total number of trees in the upper or lower strata; or

- "Core Koala Habitat" which is an area of land supporting a koala population with recent or historical sightings of koalas.

Neither Potential Koala Habitat or Core Koala Habitat areas have been identified within the areas proposed for mining and consequently no further provisions of the policy apply.

5.6.6 Impacts and Mitigation

Potential Impacts

Flora

The proposed development of the kaolin mine will result in the removal of some 25.5 ha of the vegetation that currently exists on the site. Silvertop Ash - Sydney Peppermint Forest is a common vegetation type within the area and occurs in large continuous tracts. Removal of this amount of vegetation represents a small percentage of this vegetation type and will result in negligible impacts on a regional scale.

Furthermore, the site is located in a pocket surrounded by other developments on three of its boundaries, and occurs on the edge of a large continuous tract of vegetation. The proposed development on this site will not leave any other patches of vegetation isolated. Access to the site will not result in any further clearing of the site, as existing roads will be used.

It must be recognised however, that the site is located immediately adjacent to, and up-slope of the Blue Mountains National Park, which is an important conservation reserve in the region, being part of the recently declared World Heritage Area. There exists therefore, the potential for impacts on the vegetation within the National Park if the site is not adequately managed. Measures to prevent impact on the surrounding vegetation are described throughout this EIS document, while specific measures are summarised in a later part of this section.

Fauna

The main potential habitat found to occur within the area to be disturbed by the proposed development is the Silvertop Ash - Sydney Peppermint open forest. Within this, are the "wet areas" that would provide intermittent habitat. This habitat type is extensive throughout the region, and removal of approximately 25.5 ha as a result of the proposed development does not represent a significant loss of this habitat type. The habitat value of the site is also deemed to be low, given the extensive disturbance still evident from the 1997 wildfire.

Few faunal species were identified within the study area. All of these species are commonly encountered within eucalypt forests, and none are likely to be dependent solely on this particular vegetation type for food or shelter. It is expected that any fauna with nest sites that would be destroyed by the proposed development would quickly find new shelter in the adjoining vegetation.

No rare or threatened species were detected during the survey, however a number of threatened species have previously been identified within the Newnes Plateau area, and therefore may use the site as part of their home range.

It is therefore considered that the impact on fauna and their habitat resulting from the proposed development would be insignificant on a regional scale.

Species of Conservation Significance

The Newnes Plateau area is well known for housing many flora and fauna species of conservation significance. However, no such species were identified within the site of the proposed kaolin mine, despite targeted searches aimed at detected their presence.

The area to be disturbed by the proposed development is relatively small, and was not found to contain any species of conservation significance. In the event that a rare or threatened species is present and was not detected, or is a transient visitor to the area, suitable habitat exists elsewhere in the region, including the neighbouring National Park to provide adequate replacement habitat. It is therefore considered unlikely that any species of conservation significance will be directly impacted by the development, and any indirect impacts will be mitigated by the proposed ameliorative measures discussed throughout this EIS document.

Under Part 5A of the *Environmental Planning and Assessment Act 1979,* as amended by the *Threatened Species Conservation Amendment Act 2002* (as in force at 2 October 2002), an 8-part tests of significance is required to determine whether there is likely to be a significant impact on a species or population of conservation significance.

Eight flora species and one fauna species of conservation significance were identified as being potentially present (or potential habitat present) within the area of proposed disturbance. An 8-part test of significance for flora and fauna is included as Appendix D4. Based on the assessments, it is considered that the overall impact on these threatened species will be minor, and a species impact statement is considered unnecessary.

Mitigation Measures

The vegetation to be removed by the proposed development is widely distributed throughout the area. No species of conservation significance were identified, and it is therefore considered that the impact on a regional scale would be negligible. Nevertheless, the following mitigation measures have been recommended:

- clearing of native vegetation be kept to a minimum area needed to support the operations of the mine;

- revegetation of all areas no longer required for ongoing operations be conducted as soon as is practicable;

- revegetation should include the use of species endemic to the local area to maintain genetic diversity consistent with surrounding vegetation;
- a fence erected around the site to prevent native fauna entering hazardous areas such as the pit from the surrounding vegetation.
- in the event that a threatened species is observed on the site either during the clearing, construction and establishment or operation of mine, National Parks and Wildlife Service notified immediately and a species management plan prepared by a suitably qualified ecologist;
- emissions of dust and noise should be kept to a minimum to prevent disturbance of fauna species inhabiting the surrounding area; and
- all runoff from disturbed areas is to be contained on site to prevent erosion and sedimentation in the adjacent National Park, known to house a number of flora species of conservation significance.

Conclusion

No flora or fauna species of conservation significance were observed in the area of the proposed Kaolin mine, however a number of threatened species are known from surrounding areas, and therefore may potentially be transient visitors. The diversity of fauna species, including mammals, birds and reptiles appeared to be low, and the native species that were present are all common, widespread, and tolerant of disturbance to the environment.

Loss of the Silvertop Ash - Sydney Peppermint open forest vegetation will not have a significant impact on the flora of the region, given that it is extensive in the area. Removal of this vegetation will not leave any patches of vegetation disjunct or isolated, and therefore will not reduce the value of the region for wildlife habitat.

It is considered that the proposed operation will have little direct impact on the native fauna. Removal of some potential habitat areas will also not have any major indirect impact on the fauna, due to the fact that the value of these areas as potential habitat is quite low, and the habitat type to be destroyed is common in the region.

It is therefore considered that the proposed Kaolin mine will have only minor impacts on the flora and fauna of the region, and with the incorporation of the mitigation measures described above, it is also considered that the impact on the surrounding vegetation and species of conservation significance known to inhabit the region will be negligible.

It is therefore concluded that there is no basis for preventing the development on the grounds of potential impacts on flora and fauna.

5.7 Aboriginal Archaeology and European Heritage

Robynne Mills, archaeological and heritage consultant, was commissioned to conduct an archaeological survey of the proposed Newnes Kaolin Mine. The archaeological study was designed to identify potential impacts of the proposed development on indigenous and non-indigenous heritage items, sites and places which could be impacted upon, either directly or indirectly by the proposed development.

The field component of the study was conducted by Robynne Mills and Jim Kelton, archaeological consultants on Friday 3rd December, 1999. Bathurst Local Aboriginal Land Council (LALC) was represented by Richard Peters, LALC Sites Officer.

The archaeological report is contained in full in Appendix E, and a summary of the findings present in the following sections.

5.7.1 Initial Investigations

Initial investigations carried out prior to commencement of the field survey included site and archival searches of the NPWS site data base, and the Register of the National Estate, Canberra.

The search of NPWS records identified a total of 63 sites in the vicinity of the development area however, no sites were located within the proposed mine area.

A search of the Native Title Register for the Greater Lithgow Local Government Area identified 8 Native Title Claims. None of these claims apply to the proposed Kaolin Mine area.

Heritage registers and schedules of the Australian Heritage Commission (AHC), NSW Heritage Council and Lithgow City Council were reviewed. There are a total of 45 registered sites listed by the AHC, and 20 sites registered under the State Heritage Register in the Lithgow Local Government Area (LGA). None of these sites are in the vicinity of the proposed kaolin mine.

There are a total of 33 items listed with the National Trust in Lithgow LGA. Of these one is in the vicinity of the proposed development. This item is described as:

> *All Railway bridges, buildings, tunnels etc on the Main West Line: Newnes Junction to Sodwells.*

These items are located to the south-west of the proposed site and will not be impacted either directly or indirectly by the proposed development.

There are 98 items listed in the S170 LEP Schedules of Lithgow City Council. Of the listed items two are in the immediate vicinity of the proposed development. These items are both located at Newnes Junction and include:

> *Main West Railway line: Railway items Newnes Junction-Sodwalls*
>
> *Main West Railway Line: Wolgan Valley Railway.*

5.7.2 Aboriginal Community Consultation

The survey area is on the boundary of the Deerubbin, Gandangarra and Bathurst LALCs. The mining lease was confirmed to be within the Bathurst LALC after consultation with the State LALC and Deerubbin LALC, Gandangara LALC, through Mr Lenny Malone CEO and Mr Warwick Peckham of Bathurst LALC. Following these discussions, a fax which formally advised the LALC of the pending field survey and requested LALC involvement was sent to Bathurst LALC.

LALC was asked to provide survey, a *Statement of Involvement* and to detail any concerns that the LALC might have regarding the development proposal. The LALC statement is provided in Appendix E. After the completion of the field survey, a summary document was sent to the LALC on 12th December, 1999 confirming the results of the archaeological survey.

5.7.3 Previous Archaeological Surveys within the immediate vicinity of the proposed Kaolin Mine.

Most of the archaeological investigations on the Newnes Plateau have been conducted as a direct response to development related activity (eg mine developments, power line installations, road construction etc). Such surveys were conducted by Gorecki, (1983), Brayshaw (1981, 1983), Sullivan (1981), Stockton (1983), MacIntyre (1990), Kohen (1992a, 1992b) and Rich (1992). The most comprehensive non-development specific investigation of the Newnes Plateau was done by Klim Gollan for NPWS in 1987. Results of these previous investigations are summarised in Appendix E. No studies have found any sites of significance in the study area.

5.7.4 Development of a Predictive Model

Prior to the commencement of the field survey, a desk top study of the survey area landform and archaeological land systems was conducted. As a result of this assessment, a model of site prediction and sensitivity was developed in conjunction with a strategy for survey area coverage.

Based on previous studies carried out in the area by Gollan and MacIntyre and the desk top studies, the most likely site types in the area were identified. These are:

- open camp sites which are most likely to be associated with creeklines;
- sites associated with sandstone landform areas (ie. rock shelters, art sites, grinding grooves etc) Rockshelters are most likely to be located at the base of sandstone outcrops or within eroded sandstone outliers below cliff lines where there is easy access to swamps and creeklines. Grinding grooves would be anticipated in association with water courses;
- scarred trees may occur across the survey area where old growth timber remains; and

- isolated artefacts may occur across the survey area but are most likely to be located on the ridge lines which were most likely used as transport routes through the area.

Predicted Archaeological Sensitivity

Based on the results of previous archaeological investigations in the region and a study of the topography within the study area, it was predicted that the most archaeologically sensitive micro-landform units in the study area would be ephemeral creek lines and any exposed areas of sandstone. This assessment is supported by previous work done by Gollan (1987), MacIntyre (1990) and Kohen (1992) as detailed in Appendix E.

5.7.5 Field Survey

Survey Methods

Initial reconnaissance of the survey area was conducted by vehicle and a strategy for a combined vehicle and on foot survey was designed. This survey strategy included a full on foot survey of the two ephemeral gullies on the site and a series of east/west and north/south transects along tracks across hill slope areas where visibility was high. As the surface of the site will be totally modified, it was important to cover as much ground as possible. Visibility off the tracks was poor. However the eroded shoulders of the gullies and the vehicle tracks gave access to high visibility samples of all landform units in the survey area. Details of coverage and visibility data are provided in **Appendix E**.

Survey Results

No sites or areas of potential archaeological deposit were identified in the survey. The absence of sites may be the result of physical characteristics of the survey area. The closest permanent sources of water are in Dargan Creek to the south where camp sites have been recorded (Mills 1999) and the Wollangambe River to the east. Although two ephemeral creeklines that are upper tributaries of the Wollangambe River cross the survey area, the steep, sandy nature of the soil may decrease the retention rate of water in the creek beds. The sandy soil would provide a comfortable camping area but the general terrain is steep and unsuitable for large campsites.

No non-indigenous heritage sites or relics were identified in the field assessment.

5.7.6 Site Management and Conclusion

Site Management

NKPL, as a developer, has an obligation under the National Parks and Wildlife Act 1974, to determine if their proposed mine will impact upon indigenous heritage and where required, take ameliorative action. The following recommendation has been developed to minimise the potential impact of the mining development on heritage items and places and to ensure that the proposed development is accommodated

within a management framework that is endorsed by NPWS and includes consultation with Bathurst LALC.

- Recommendation 1

In the unlikely event that cultural heritage items should be located during mining, all activity should cease in the vicinity of the heritage item and a representative of NPWS should be contacted so that a plan of management can be prepared for the heritage material.

Legal Requirements and Obligations

All non-indigenous heritage items are protected by the NSW Heritage Act (1975 and the EP & A Act (1979). All indigenous relics (sites and objects), other than those made for sale, are protected under the New South Wales National Parks and Wildlife Act 1967 (amended 1974). Archaeological sites are a non-renewable resource, valued for the information they can provide on the lifestyles of people in the past, and are also valued by local communities who maintain cultural links with the past through these sites and places.

It is illegal to damage or destroy a site or relic without the prior consent of the Director of NSW NPWS and/or DUAP. Any such disturbance requires a permit from the Director. The NPW Act requires that the relics recovered under such a permit come under the custody of the Australian Museum in Sydney or the LALC, if a Care and Control Permit has been issued.

Conclusion

As no sites or areas of potential archaeological sensitivity were identified in the survey, it is concluded that there is no archaeological impediment to the project proceeding as planned.

5.8 Fire Control and Management

The site of the proposed mine has a high risk of bushfire, given that it is surrounded on three sides by native vegetation. The risk of bushfires is evident by the level of past disturbance resulting from the 1997 wildfire that swept across the site. In order to minimise the risk of fire, the following control measures will be employed:

- cleared vegetation of a suitable size would be mulched, chipped or burnt for use in rehabilitation;
- any burning would be carried out under controlled conditions with fire fighting equipment on hand;
- staff would be present at the site to assist in early detection and response;
- fire fighting equipment would be available on site at all times;

- fire extinguishers will be installed on mobile machinery and at appropriate fixed locations;
- all site staff will be trained in fire fighting procedures;
- access to stored water in ponds for fire fighting purposes will be maintained at all times; and
- the project will comply with statutory requirements of the *Bushfire Act 1941*.

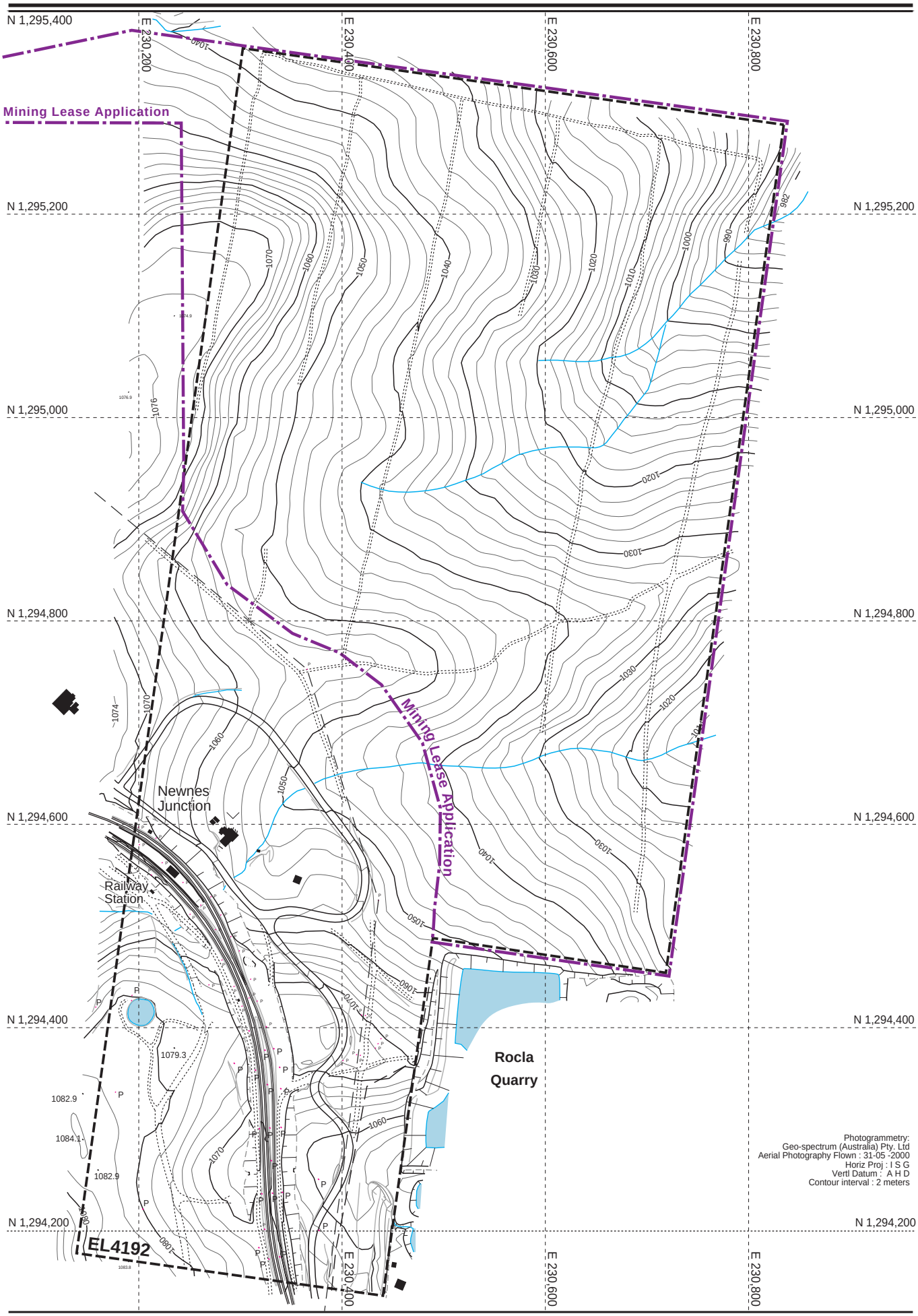

FIGURE 5.1
Newnes Kaolin Project -Topography

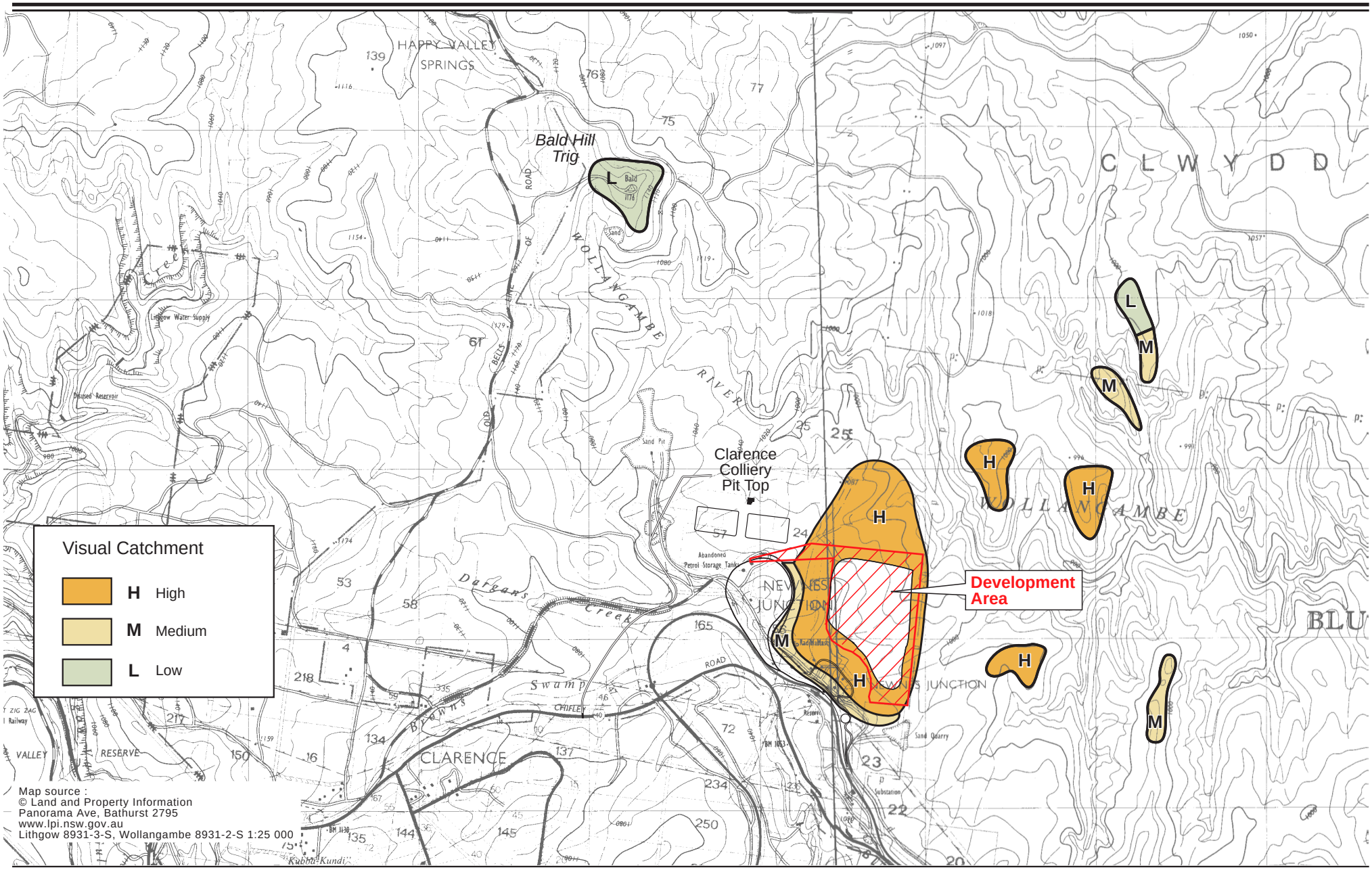

FIGURE 5.2
Visual Catchment

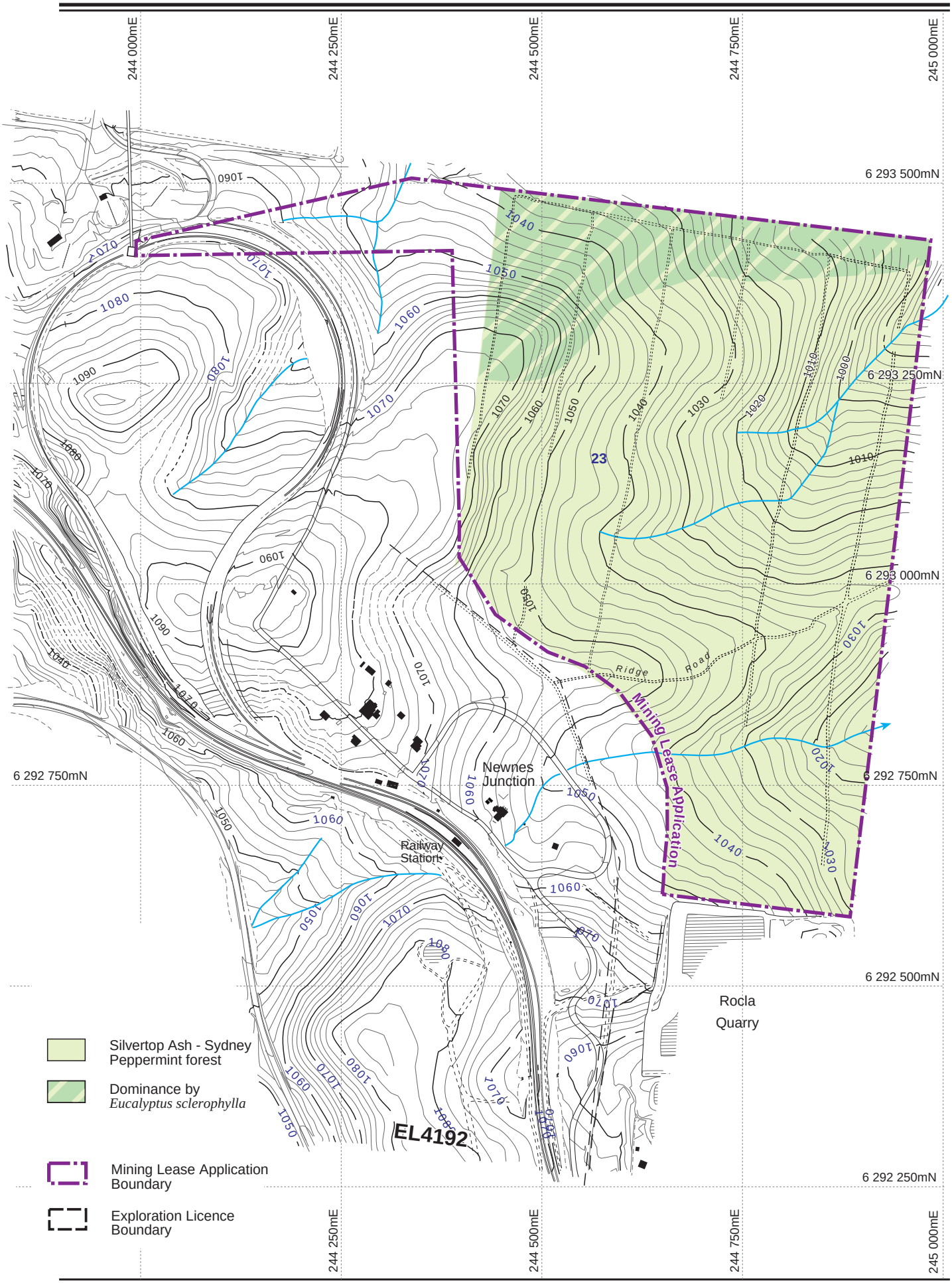

FIGURE 5.3
Newnes Kaolin -Vegetation Map

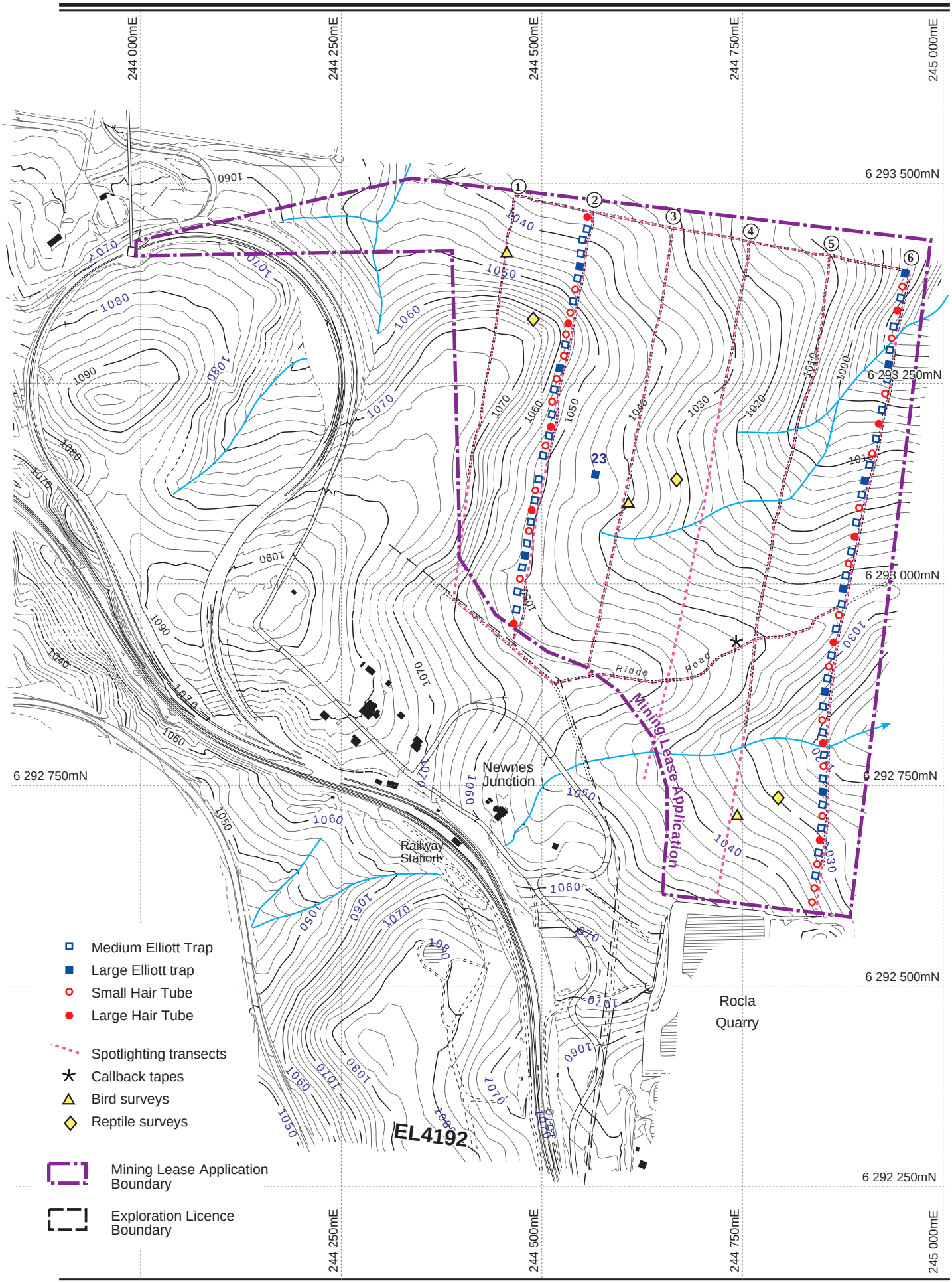

FIGURE 5.4
Newnes Kaolin
Fauna Sampling Sites