

According to Martens, the potential for site contamination is limited to the identified hotspots which surround existing dwellings, rural sheds, yards, and the various rubbish piles, paddocks used for cropping and grazing, and sedimentation of dams which may have resulted in an accumulation of heavy metals, herbicides and pesticides over the 35 year history of this activity. The Stage 1 Contamination Assessment recommended that additional assessment be undertaken in order to determine the extent of actual contamination at the site.

5.4.2.3 *Stage 2 – Environmental Site Assessment*

Following the preliminary Stage 1 Assessment undertaken by Martens, a Stage 2 Environmental Site Assessment was undertaken to more fully assess the site and actual levels of contamination existent at the site.

The assessment undertaken by Martens Consulting Engineers was done in accordance with the requirements of the NSW Office of Environment and Heritage (OEH) and Department of Environment and Conservation (DEC). The assessment included the collection of samples from a total of 48 separate locations across the site and included boreholes, test pits, stockpiles and from the lands surface. These samples were subsequently tested at a NATA accredited laboratory for the presence of chemicals of concern. The Environmental Site Assessment undertaken by Martens Consulting Engineers revealed that site contamination was restricted to Area B located in the south-eastern corner of Lot 3 DP 568613 with contamination arising from empty fuel cans, motor oil containers, lubricants and disused motor vehicles which have been discarded on the property.

Martens in the Environmental Site Assessment recommended that a remediation action plan be prepared.

5.4.2.4 *Remedial Action Plan*

Martens Consulting Engineers prepared a Remedial Action Plan in order to identify remediation measures necessary to ensure that the site is suitable for the residential use proposed.

The assessment of Martens considered the following options for site remediation:

- *On-site treatment of the contamination so that is it destroyed and the associated risk is reduced to an acceptable level.*
- *Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which the soil is returned to the site.*

- *Removal of contaminated material to an approved facility, followed (where necessary) by replacement with appropriate material.*
- *Cap and contain material onsite with an appropriately designed barrier.*
- *Do nothing.*

In order to meet the objectives of the project and suitably address the range of contaminants identified at the site, Martens has recommended that remediation be undertaken by way of excavation, and offsite disposal. The Remedial Action Plan prepared by Martens Consulting Engineers has outlined a methodology to ensure suitable remediation of the site and which involves identification of a remediation strategy, soil validation, and waste management, culminating in a Validation Report outlining that the site is suitable for the residential use. These works are to be undertaken in conjunction with the subdivision works.

5.4.2.5 *Conclusions and Recommendations*

Martens Consulting Engineers have prepared a comprehensive Contamination Assessment that has included a Stage 1 Preliminary Assessment, Stage 2 Environmental Site Assessment that has involved soil sampling and analysis, and finally a Remedial Action Plan.

The works recommended in the Remedial Action Plan are to be undertaken in conjunction with the works to implement the proposed subdivision.

5.4.3 Geotechnical Issues and Acid Sulfate Soils

5.4.3.1 *Introduction*

This section deals with geotechnical constraints, and the potential for the existence of acid sulfate soils affecting the site and the major project subdivision proposal. This section is based on the report titled Preliminary Geotechnical Constraints Assessment prepared by Martens Consulting Engineers which forms **Annexure 4** of this EA. It addresses the methodologies that were adopted, along with the findings and recommendations.

5.4.3.2 *Methodology*

Martens Consulting Engineers were engaged to undertake a geotechnical constraints assessment, including:

- Site classification in accordance with AS 2870 (1996): Residential slabs and footings – Construction;

- Hazard risk assessment to review slope stability, hazard identification, viability of proposed development, and recommended treatment measures if required;
- Drainage and subsurface moisture conditions; and
- Acid sulfate soils assessment.

5.4.3.3 Acid Sulphate Soils Assessment

GIS mapping information of the property prepared by SCC indicates that the property is not mapped as a potential acid sulfate soil site. This is reproduced as **Figure 13**.

According to Martens Consulting Engineers, the site has

“an elevation of 36-70m AHD with an underlying geology of sedimentary rock. Soil profiles observed on site are residual or colluvial in character and are not recent (Holocene or Pleistocene) deposits. As such, there is considered to be negligible risk of acid sulfate soils on the site.”

The findings of Martens Consulting Engineers confirm the mapping prepared by SCC and contained within their GIS.

Consequently, it is unlikely that acid sulfate soils are present on the site and therefore do not pose a constraint to development of the site and further testing is not warranted. Further, as acid sulfate soils are unlikely to be present at the site, further mitigation or management in the development of the project is considered unnecessary.

5.4.3.4 Geotechnical Assessment

Geological Conditions

Martens Consulting Engineers undertook a preliminary desk top assessment and research involving a review of the relevant NSW Geological sheet (Wollongong 5609) as well as onsite investigation, sampling and testing which showed that the site was underlain by Nowra Sandstone which is a subgroup of the Megalong Conglomerate Group geology.

According to Martens Consulting Engineers, the site is underlain by weathered sandstone of various grades, whilst a site inspection of the southern portion of the site revealed it is underlain by Limonite or Geothite concretions, the full extent of which is unknown at this time. Field investigations undertaken by Martens revealed that the depth to weathered rock ranges from 0.5 metres below ground level (b.g.l.) in the southern portion of the site, to greater than 2.5 m b.g.l. at lower elevations which occur in the northern section of the property.

According to Martens Consulting Engineers, some rock outcropping was evident along the eastern portion of the site.

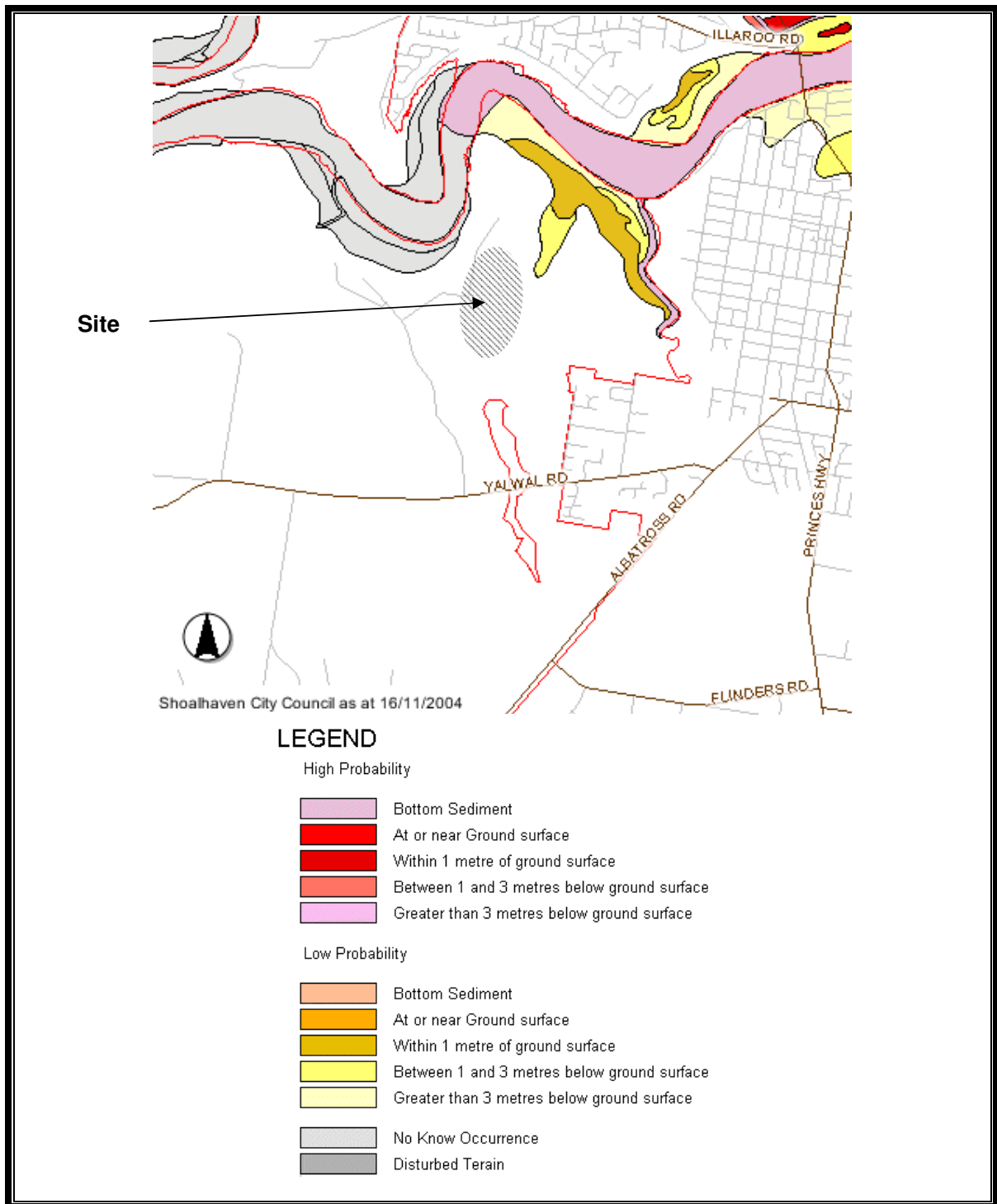


Figure 13: Acid Sulfate Soil mapping (Extract from SCC GIS)

Soil Landscape Mapping

The subject site is mapped on the 1:100 000 Soil Landscape Map for Kiama as being within the Nowra Landscape. Within the Nowra Landscape soils conditions are moderately deep, being between 0.5 m and 1 metre in depth with the soil being brown podsolic on crests and upper slopes, with yellow earths or yellow podsolic soils on mid slopes and drainage depressions.

According to Martens Consulting Engineers, the Nowra Landscape has moderate to high erosion potential, with limitations apparent due to shallow soil profiles, rock outcropping and low wet bearing strength.

Inconsistent sub surface conditions apply across the site due to the changes in topography, however according to Martens Consulting Engineers, the soil profile is organic silty sand, overlying clayey sand, which overlies residual soils, which at varying depths grades to extremely weathered rock.

Soil testing undertaken by Martens Consulting Engineers indicated that the site contains the following sub-surface conditions:

- ❑ Category One – generally found along the upper elevations and eastern portions of the site (dominated by very shallow soil profiles < 1 m / exposed sandstone bedrock).
- ❑ Category Two – located on the upper elevations in the south western portion of the site (soil profiles 1 - < 2 m).
- ❑ Category Three – located along the drainage depression in the north western area of the site (deeper soil profiles > 2 m).

Findings

Foundation Class

Based on the findings of the assessment undertaken, Martens Consulting Engineers have been able to allocate a foundation class to each of the relevant sub-surface conditions identified above in accordance with the requirements of AS 2870. In this regard, it has been advised that Category 1 is “A”, Category 2 is generally considered “S”, and Category 3 is considered “M” or “H” in accordance with AS 2870.

Risk and Constraints

The assessment undertaken by Martens Consulting Engineers has enabled them to identify hazards and risks associated with the development of the site. Whilst Martens Consulting Engineers advised that the potential for rock fall, due to the presence of steep

slopes and rock outcropping along the eastern perimeter of the site existed, this did not present a risk to development from slope instability, as this area is located in the proposed conservation zone and would not be developed. The steeper slopes are also associated with the eastern portion of the site which comprises native forest vegetation and will comprise the conservation zone. The layout of the subdivision does not propose the development of lands in this portion of the site, which is to be preserved in its current vegetated state for conservation purposes.

Based on the assessment undertaken by Martens Consulting Engineers, development of the site contains only minor geotechnical constraints, with these limited to shallow groundwater table, poor drainage, and low bearing strength and erodibility of the sub-surface soils.

Management and Monitoring

Based on the findings of the work undertaken through assessment of relevant geological and soil maps, coupled with an inspection of the subject site and surrounds, a series of recommendations have been made in relation to the further development of the site that deals with issues such as the placement of fill, control of excavations, footings and foundations and retaining structures.

Conclusions

Martens Consulting Engineers have undertaken an assessment of the subject site and prepared a Preliminary Geotechnical Constraints Assessment for the subdivision the subject of this Part 3A Major Project application.

Martens Consulting Engineers conclude that “from a geotechnical perspective, we consider that the site is suitable for the proposed development, subject to the recommendations and preliminary treatment measures as outlined in the report.”

5.4.4 Bushfire Risk Assessment

5.4.4.1 Introduction

The subject site is identified by mapping prepared by Shoalhaven Council and endorsed by the NSW Rural Fire Service (RFS) as being bushfire prone. In this regard, **Figure 14** below is an extract from SCC's GIS which shows the extent of bushfire prone lands affecting the subject site and surrounding lands. This shows that the western portions of the site are either not identified as being bushfire prone, or alternatively contain buffer to forest vegetation, and this coincides with the extent of cleared land on the subject site. Lands to the east are identified as containing vegetation Category 1 and a buffer, generally coinciding with land comprising native forest.

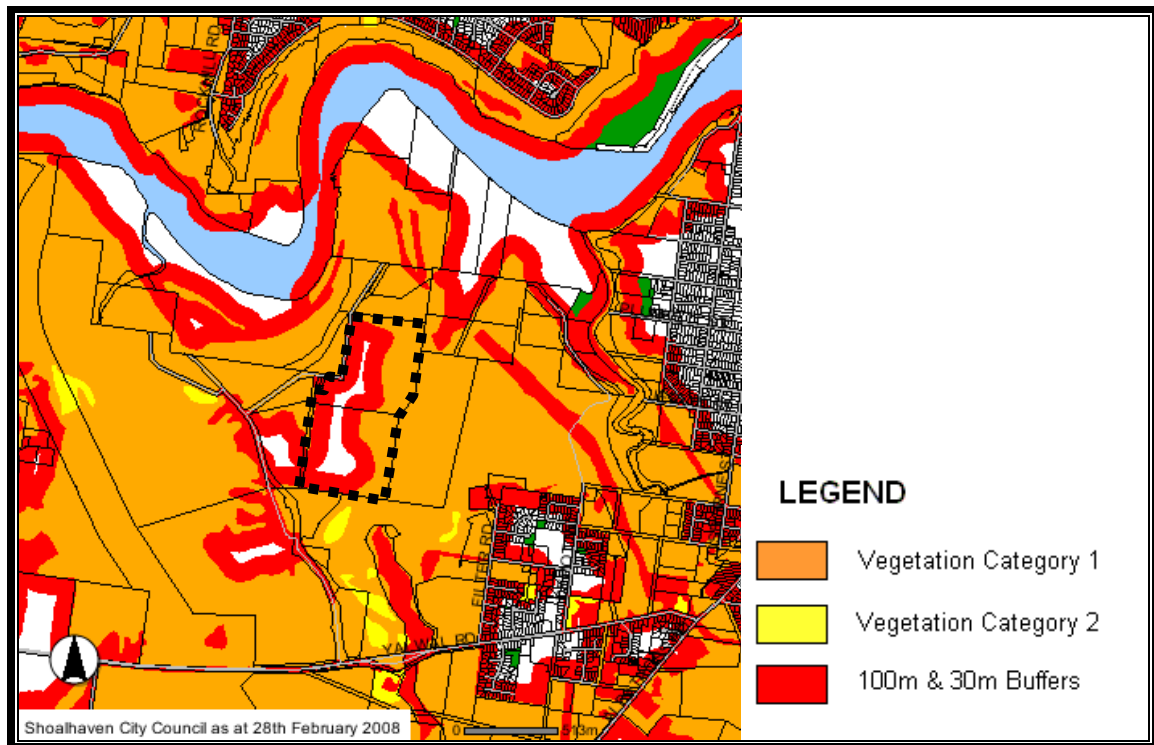


Figure 14: Extent of Bushfire Prone Lands (extract from SCC GIS).

Furthermore, the extent of native forest in the vicinity of the site would indicate that the site is subject to some risk of bushfire hazard.

In response to this Eco Logical Australia (ELA), were engaged to prepare a Bushfire Protection Assessment to assess the impacts of bush fire risk on the major project application. This is shown as **Annexure 6**.

The following sections of the EA are based on the findings of this report.

5.4.4.2 Methodology

This Bushfire Protection Assessment undertaken by ELA has been prepared in accordance with the documents “*Building in Bush Fire Prone Areas – Guidelines for Subdivision Applications*” (NSW Rural Fire Service) and “*Planning for Bushfire Protection*” (PBP guidelines) (NSW Rural Fire Service, DIPNR).

5.4.4.3 Assessment

Vegetation Types and Slopes (Part B of PBP)

ELA have assessed the relevant vegetation type for a distance of 140 metres from the site, and slope most significantly affecting fire behaviour for a distance of at least 100 m as required under PBP. According to ELA, the predominant vegetation type is forest in

all directions. Having regard to slopes, ELA advise that these are predominantly downslope and generally $> 0 - 5^\circ$ and $> 5^\circ - 10^\circ$, with slopes in the south-eastern corner of the site falling downslope $> 15^\circ - 18^\circ$ and these are shown in Figure 3 of the ELA report.

Asset Protection Zone (APZ) (Part C of PBP)

ELA have assessed the relevant vegetation and slopes, and have advised of relevant APZ requirements for implementation. ELA have recommended APZ ranging from a minimum of 20 m up to a maximum of 60 m.

ELA have advised that existing APZs around the established dwelling which is to be retained are adequate.

The subdivision layout has been prepared in accordance with the recommendations.

APZ Maintenance (Part D of PBP)

Fuel management within the APZ is to be as follows:

- No tree or tree canopy is to occur within 2 m of the dwelling roofline.
- The presence of a few shrubs or trees in the Inner Protection Area is acceptable provided that they:
 - are well spread out and do not form a continuous canopy;
 - are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
 - are located far enough away from the building so that they will not ignite the building by direct flame contact or radiant heat emission.
- Any landscaping or plantings should preferably be local endemic mesic species or other low flammability species.
- A minimal ground fuel is to be maintained to include less than 4 tonnes per hectare of fine fuel (fine fuel means ANY dead or living vegetation of < 6 mm in diameter eg. twigs less than a pencil in thickness. 4 t/ha is equivalent to a 1 cm thick layer of leaf litter); and
- Any structures storing combustible materials such as firewood (eg. sheds) must be sealed to prevent entry of burning debris.

Construction Standards (Part E of PBP)

ELA have advised that further development on the allotments can be undertaken in accordance with the requirements of AS3959 – 2009, which will be determined at the development application stage for each dwelling. ELA advise however the Bushfire Attack Levels (BALs) within the proposed subdivision are likely to range from BAL-29 down to BAL-12.5, whilst lots sited in excess of 100 m from an identified bushfire hazard will not require any will not require any specific bushfire protection measures.

The existing dwelling which is proposed to be retained will require upgrading in order to comply with AS3959 in the form of aluminium flyscreen mesh to openable windows and wire screening of other openings.

Water Supply (Part F of PBP)

The subject site is to be serviced with reticulated water supply which will be available for use by the RFS for fire fighting purposes. ELA have made recommendations relating to the provision and design of such supply and in particular the location of hydrants. The proposal can comply with the provisions of PBP in relation to supply of water.

Gas and Electricity Supply (Part G of PBP)

The site is to be provided with underground electricity supply which will be reasonably protected in the event of bushfire.

In relation to gas supplies, ELA have advised that any gas supply be installed and maintained in accordance with AS 1596, and metal piping be used in its installation.

The proposal will comply with respect to these matters.

Property Access Roads and Public Road System Capacity (Part H of PBP)

According to ELA, the property has connection to the high capacity public road system in the south-western corner of the site, formed by Yalwal Road. In addition, alternative access and egress routes are available from the western and north-western sides via Jonsson Road.

ELA have identified egress/ingress routes from the south-west, west and north-west.

ELA have advised that the proposed fire trail surrounding six allotments will comply with the design standards of PBP.

ELA have examined the proposed road network and fire trail and have concluded that these will comply with the requirements of PBP.

5.4.4.4 Staging

The assessment of ELA has considered the impact of the staging of the proposed subdivision. In this regard, ELA have recommended either a perimeter road or a perimeter fire trail in accordance with the requirements of PBP for each stage in the subdivision, plus the provision of APZs for those lots sited on the perimeter of a stage.

5.4.4.5 Recommendations and Conclusion

The subject site is identified by mapping prepared by SCC and endorsed by the NSW RFS as being bush fire prone. In consideration of the risk, ELA were engaged to prepare a Bushfire Protection Assessment (BPA) and assess the proposal against the requirements of PBP. ELA have made the following recommendations in order to ensure compliance with the requirements of the PBP:-

Recommendation 1: Asset protection zones are to be provided to the proposed subdivision indicated in Figure 3 of the BPA.

Recommendation 2: Asset protection zone landscaping is to comply with the NSW Rural Fire Service document 'Planning for Bush Fire Protection 2006' inner protection area requirements as listed in Appendix 2 Section A2.2 of PBP and guided by the fuel management principles listed in Section 4 of this report.

Recommendation 3: Future landscaping for individual lots across the subdivision is to comply with the principles listed in Appendix 5 of PBP.

Recommendation 4: A hydrant water supply should be installed in accordance with Australian Standard AS 2419.1.

Recommendation 5: Public roads are to comply with the NSW Rural Fire Service document 'Planning for Bush Fire Protection 2006' as listed in Section 8 of this report.

Recommendation 6: Electrical services should be underground.

Recommendation 7: Gas services are to be installed and maintained in accordance with AS/NZS 1596:2008 (Standards Australia 2008).

Recommendation 8: Each stage of the subdivision is to be provided with either a perimeter road or a perimeter fire trail to the standards described in Table 1 and Table 2 of the BPA (respectively).

The Bushfire Protection Assessment prepared by ELA concludes with respect to this proposal:

"In the author's professional opinion the bushfire protection requirements listed in this assessment provide an adequate standard of bushfire protection for the proposed development, a standard that is consistent with the Planning for Bushfire Protection guidelines (RFS 2006) and appropriate for the issues of a Bushfire Safety Authority."