Edge Geotechnical

J22043-001 20 December 2022

Experience Oz Pty Ltd
51 Atkinson Street
LITHGOW NSW 2790

Desk Top Study and Preliminary Geotechnical Advice for Eco Cabin Development
51 Atkinson Street Lithgow NSW (Lot 152 DP 659519)

Introduction

In response to your request, Edge Geotechnical Pty Ltd (Edge) has carried out a desk top study, site visit and provides preliminary geotechnical recommendations herein regarding the proposed development at 51 Atkinson Street, Lithgow, NSW

Based on the information provided in your email, we understand that **you:**

1) Advice on subsurface conditions at proposed cabins sites to provide input into shallow footing design (design by others).
2) require a site classification in accordance with AS2780-2011 "Residential Slabs and Footings"
3) will submit the above documents to Lithgow City Council (LCC) for the purpose of obtaining development approval and detail design of the new residential dwelling and an associated construction certificate.

Scope of Work

To provide the information needed and based on our understanding of your needs, **Edge** proposed a staged approach top geotechnical investigations at the above site. This report provides preliminary advice on the above three items, as part of Stage 1 of the geotechnical scope of services. as follows:

Stage 1 – Desk top study and Preliminary Advice for DA Purposes

- Review local geological maps for the area, published historical aerial photographs and other published information including mine subsidence areas.
- Site visit
- Letter report to assist in development application, outlining anticipated site classification for footing design and proposed approach to complete geotechnical investigations to assist in engineering/design prior to application for construction certificate

Stage 2 of the geotechnical investigations (yet to be carried out) will involve subsurface investigations across the site and associated geotechnical reporting, with the aim of providing geotechnical design advice for shallow footings on the site (in lieu of extending footings for structures through the fill and into natural soil/weathered rock).

Site Description

The block is located at the northern end of Atkinson Street, at the junction with State Mine Gully Road, Mort's Estate, Lithgow. The site is bounded by the Zig Zag Railway line to the east, State Mine Creek to the west and the Lithgow State Mine Heritage Park to the north. The site topography slopes gently to the west towards State Mine Creek.

According to geology maps published by the Geological survey of NSW, the site is located close to the boundary between the geological unit described as Narrabeen Group of Sandstones and the Permian aged Illawarra Coal Measures comprising shale, sandstone, conglomerate and chert with coal seams.

Soil landscapes have been mapped by NSW Department of Planning and Industry and published data indicates that the site is underlain by soils from the Lithgow (li) Soil Landscape. The Lithgow soils are generally on valley floors with rare rock outcrop, with moderately deep soils comprising sandy topsoil and sandy clayey residual soils derived from the parent rock. Foundation hazard is low high but soil may have moderate shrink swell potential, and mine subsidence may be present. A copy of the soil landscape report is attached.

The site has a history of use as laydown area for mine waste and coal chitter from the nearby underground mine workings and uncontrolled fill is present across the site. Historical records suggest the area may have been used in the early 1900s, suggesting that the fill on the site is more than 50 years old.

The photograph below is extracted from the NSW Spatial Services Historical Imagery portal and is dated 1998. The site has been relatively unchanged since 1998.

Photo 1: 1998 Historical Imagery

A property report provided by the NSW Planning Portal ePlanning Spatial Viewer (extracted 20th December 2022) indicates that the site is located within Mine Subsidence and development Guideline 2 applies to the site. A copy of the property report is attached. Guideline 2 has some restrictions on development due to potential subsidence risk due to non-active workings. A copy of Guideline 2 is attached.

Preliminary Geotechnical Recommendation.

Geotechnical field work comprised a desk top study and site visit. The site visit was carried out on 10th November 2022 in the presence of our Principal Geotechnical Engineer. The site was grassed at the time of our visit.

Table 1 below provides a summary of photographs taken during the site visit.

Table 1 – Site Photographs

Photo ID	Description
P1	 View of Principal Development Area
P2	 View of Principal Development Area from North looking South

Table 1 – Site Photographs

Photo ID	Description
P3	 Photo of Fill Exposure on Site

Site fill was exposed in shallow cutting on the site and is described at as silty gravel, fine to coarse grained, with coal chitter and some cobble size fragments, consistent with our understanding of the site history. The fill appeared to be medium dense to dense on visual inspection, however it would be considered as "uncontrolled" in accordance with AS2870-2011 "Residential Slabs and Footings". On this basis, the preliminary site classification is Class P, which requires footings on the site to be designed in accordance with engineering principles.

Stage 2 of the geotechnical investigations will provide input into suitable design parameters for footings at the site. Based on the age of the fill, and depending on the outcomes of the Stage 2 geotechnical investigations, footings for the proposed lightweight eco-cabins on the site will aim to found at high level on top of the fill.

For and on behalf of

Edge Geotechnical Pty Ltd

Karen Allan BEng (Hons), CPEng FIEAust IntPE(Aus) GradDip(Pavements)

Principal Geotechnical Engineer, Director

Attachments:

Lithgow Soil Landscape Report (3 pages)

NSW Planning Property Report (3 pages) NSW

Subsidence Advisory Guideline 2 (5 pages)

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li LITHGOW

Landscape—flat to undulating rises and broad valley floors on Illawarra Coal Measures and the Berry Formation. Local relief to 20 m. Slopes <10%. Elevation approximately 800 – 1 000 m. Localised rock outcrop. Extensively cleared open-forest and open-woodland.

Soils—moderately deep (<120 cm) Red Podzolic Soils (Dr3.41) and Yellow Podzolic Soils (Dy2.11, Dy3.11) and Yellow Leached Earths (Gn2.34) on upper slopes and well-drained areas. Moderately deep to deep (>170 cm), Solods/yellow Solodic Soils (Dy2.41, Dy3.41) on lower slopes and in areas of poor drainage.

Limitations—hardsetting topsoils, high run-on, localised Mine Subsidence District, localised rock fall hazard, localised high potential aluminium toxicity.

LOCATION

Occurs at Lithgow, Wallerawang and north of Ben Bullen. The mapped occurrence at Area reference 2 **33*****E, 62 **96*****N is typical of this soil landscape.

LANDSCAPE

Geology

Parent materials include the Illawarra Coal Measures and the Berry Formation. Horizontally bedded shale, sandstone, siltsone, mudstone, claystone, limestone, coal, torbanite and conglomerate are the main rock types.

Topography

Flat to gently inclined rises on broad (>300 m) valley floors away from major drainage lines. Local relief is <25 m. Slope gradients are typically <10%. Elevation is mostly 800 – 1 000 m. Rock outcrop is rarely present.

Vegetation

Extensively cleared open-woodland and forest. Common tree species include scribbly gum (*Eucalyptus rossii*), snow gum (*Eucalyptus pauciflora* ssp. *pauciflora*), brittle gum (*Eucalyptus mannifera* ssp. *mannifera*), broad-leaved peppermint (*Eucalyptus dives*), red stringybark (*Eucalyptus macrorhyncha* ssp. *macrorhyncha*) and black wattle (*Acacia decurrens*). Grassy understoreys of tussock grass (*Melichrus urceolatus*), blown grass (*Agrosits avenacea*), kangaroo grass (*Themeda australis*) and wallaby grass (*Danthonia* spp.) survive, in addition to occasional shrubs of wattle (*Acacia* spp.), guinea flower (*Hibbertia* spp.), tea-tree (*Leptospermum* spp.) and common bracken (*Pteridium esculentum*).

Land Use

Lithgow and Wallerawang are urban/residential. Elsewhere land is largely freehold and devoted to sheep and beef cattle grazing. Coal and shale mines are scattered throughout.

Existing Erosion

Moderate gully erosion is evident along some drainage lines. Sheet erosion is occasionally present and, where severe, topsoil materials may be completely eroded.

Included Soil Landscapes

Pipers Flat **(pf)** soil landscape near drainage depressions and Cullen Bullen **(cb)** soil landscape on upper slopes have been included over parts of the Lithgow soil landscape. Small areas of Disturbed Terrain **(xx)** comprised of coal reject and overburden and landfill are common. Soils at these areas are often severely contaminated.

SOILS

Dominant Soil Materials

li1—Dull yellowish brown sandy loam (topsoil)

Colour	dull yellowish brown (10YR 5/4) to brownish black (10YR 2/2)
Texture	sandy loam to loam fine sandy
Structure	massive to weakly pedal, crumb peds (2 – 10 mm)
Fabric	earthy, rarely rough-faced
pH	slightly acid (pH 6.0 – 6.5)
Coarse fragments	occasional sub-angular sandstone fragments
Roots	common to abundant
Exposed condition	firm
Permeability	high
Type location	roadside cutting near sewage works, Lithgow (Map reference 2 **34**07*E, 62 **92**00*N). Soil Data Card 99, 0 – 11 cm

li2—Dark reddish brown clay loam (topsoil)

Colour	dark reddish brown (5YR 3/3) to greyish yellow brown (10YR 4/2)
Texture	clay loam to fine sandy clay loam
Structure	massive
Fabric	earthy
pH	slightly acid (pH 6.0 – 6.5)
Coarse fragments	occasional platy shale gravels
Roots	common to abundant
Exposed condition	firm to hardsetting when dry
Permeability	moderate
Type location	beneath power lines at end of dirt road (Map reference 2 **33**40*E, 62 **94**00*N). Soil Data Card 24, 0 – 10 cm

li3—Hardsetting bleached massive fine sandy clay loam (topsoil)

Colour	dull yellow orange (10YR 6/3) to yellowish brown (10YR 5/6) to bright reddish brown (5YR5/6), conspicuously bleached
Texture	fine sandy clay loam to silty loam to sandy clay loam
Structure	massive
Fabric	earthy
pH	moderately acid (pH 5.5) to slightly acid (pH 6.5)
Coarse fragments	few to common angular platy shale and siltstone gravels and occassional cobbles
Roots	few
Exposed condition	hardsetting when dry
Permeability	slow
Type location	Coxs River Trail in small cutting (Map reference 2 **26**45*E, 62 **93**04*N). Soil Data Card 60, 0 – 30 cm

li4—Angular blocky medium clay (subsoil)

Colour	variable from reddish brown (5YR 4/8) to bright yellowish brown (10YR 7/6) with white/grey mottles increasing with depth
Texture	medium clay
Structure	massive when wet, strong angular blocky (<20 mm) peds when dry, parting to polyhedral peds
Fabric	smooth-faced
pH	slightly acid (pH 6.0) to slightly alkaline (pH 7.5)
Coarse fragments	few
Roots	few
Exposed condition	not usually exposed
Permeability	slow to moderate
Type location	Coxs River Trail in road cutting (Map reference 2 **26**45*E, 62 **93**04*N). Soil Data Card 60, 30 – 50 cm

Associated Soil Materials

Leaf litter layer. Occasionally a small (<5 cm) leaf litter layer is present.

Occurrence and Relationships

Crests, upper slopes and well-drained areas. Typically 0 – 20 cm of dull yellowish brown sandy loam **(li1)** or dark reddish brown clay loam **(li2)** overlies <20 cm of hardsetting bleached massive fine sandy clay loam **(li3)**, beneath which lies up to 70 cm of angular blocky medium clay **(li4)**. Soil boundaries are usually clear or less frequently gradual, and soil depth is <120 cm [moderately to well-drained Yellow Podzolic Soils (Dy2.11, Dy3.11) and occasional Red Podzolic Soils (Dr3.41) and Yellow Leached Earths (Gn2.34)].

Lower slopes and less well-drained areas. Up to 35 cm of **li1** or **li2** overlies <30 cm of **li3**. There is a clear boundary to up to 100 cm of **li4** [imperfectly drained Solods/ yellow Solodic Soils (Dy3.41, Dy2.41)]. Total soil depth is usually <150 cm.

LIMITATIONS TO DEVELOPMENT

Soil Limitations

li1	High organic matter (localised) High erodibility
li2	High organic matter (localised) Hardsetting Strong acidity Very high potential aluminium toxicity
li3	Hardsetting Very high potential aluminium toxicity (localised) Strong sodicity/dispersibility (localised) Very low fertility
li4	Moderate shrink-swell potential (localised) Very high potential aluminium toxicity (localised) Low permeability Very low fertility

Fertility

Fertility of soil materials is low. All soil materials have low to very low CEC, are acid with very low phosphorus and calcium. Exchange potassium is variable. **li2, li3** and **li4** have very high potential aluminium toxicity and are occasionally sodic in poorly drained areas. **li1** and **li2** generally have low expected pH buffering capacity while **li3** and **li4** have moderate to high expected pH buffering

capacity. Available water-holding capacities are low to moderate. Hardsetting topsoils may restrict deep root penetration.

Erodibility

	K factor	Non-concentrated flows	Concentrated flows	Wind
li1	0.057	high	high	low
li2	0.027	moderate	moderate	low
li3	0.059	high	moderate	low
li4	0.030	moderate	high	low

Erosion Hazard

	Non-concentrated flows	Concentrated flows	Wind
grazing	slight	slight	slight
cultivation	slight	moderate	slight
urban	slight	mod-high	slight

Foundation Hazard

Foundation hazard is generally low. **li4** has localised moderate shrink-swell potential and therefore moderate foundation hazard. Depth to subsoil is <35 cm. Total soil depth is mostly <120 cm.

Landscape Limitations

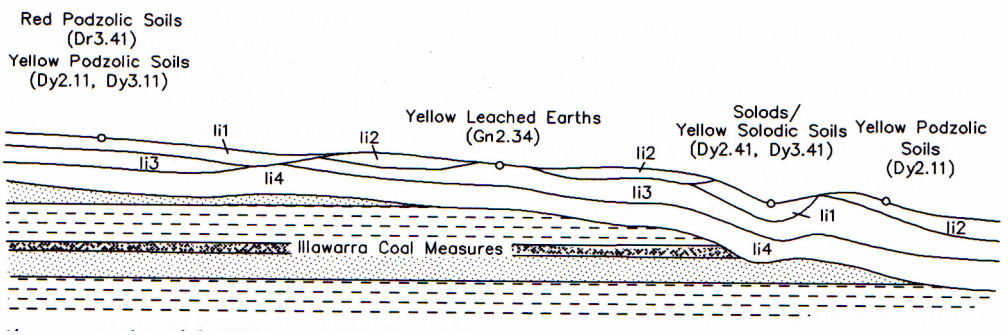
Hardsetting surfaces
Mine Subsidence District (localised)
High run-on
Rock fall hazard (localised)

Urban Capability

Low to moderate limitations for urban development.

Rural Capability

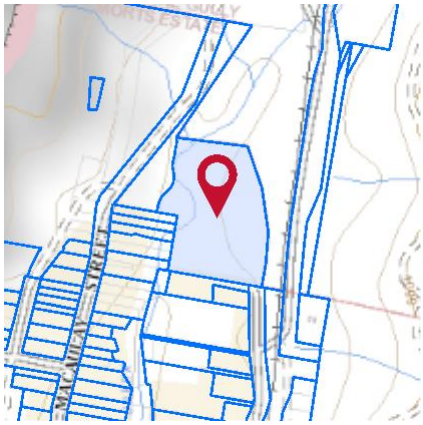
Low limitations for grazing, moderate limitations for regular cultivation.



■ *Schematic cross-section of the Lithgow soil landscape illustrating the occurrence and relationship of the dominant soil materials.*

Property Report

51 ATKINSON STREET MORTS ESTATE 2790



Property Details

Address:	51 ATKINSON STREET MORTS ESTATE 2790
Lot/Section /Plan No:	152/-/DP659519
Council:	LITHGOW CITY COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Lithgow Local Environmental Plan 2014 (pub. 14-4-2022)
Land Zoning	C3 - Environmental Management: (pub. 5-11-2021)
Height Of Building	NA
Floor Space Ratio	NA
Minimum Lot Size	40 ha
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Flood Planning	Flood Planning Area (From the 14 July 2021 flood maps on the ePlanning spatial viewer may not be the latest versions, please contact the relevant local council to access the latest flood maps for this property.)
Local Provisions	Former LEP Boundaries

Detailed planning information

State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Excluded (pub. 21-10-2022)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021: Subject Land (pub. 2-12-2021)
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Industry and Employment) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Planning Systems) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Primary Production) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resilience and Hazards) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Resources and Energy) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy (Transport and Infrastructure) 2021: Land Application (pub. 2-12-2021)
- State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development: Land Application (pub. 26-7-2002)

Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

Biodiversity Value (BV) Map	Clearing native vegetation for a development on an area on the BV Map may require a Biodiversity Development Assessment Report. Consult your local council.
Bushfire Prone Land	Vegetation Buffer
Local Aboriginal Land Council	BATHURST
Mine Subsidence Development	Guideline: 2 Full Guideline Development guidelines Note Development guidelines are subject to change.
Mine Subsidence District	LITHGOW
Regional Plan Boundary	Central West and Orana
Sydney Trains Corridor Protection Zone – Infrastructure SEPP	Clause 86/Concurrence

Surface Development Guideline 2 – Potential subsidence risk non-active workings

Requirements, information and guidance for development on properties over non-active coal mine workings

SUBSIDENCE ADVISORY NSW

Contents

1. Introduction

Subsidence Advisory NSW (SA NSW) is the NSW Government agency responsible for regulating and administering the mine subsidence compensation system in NSW.

SA NSW has developed and applied surface development guidelines (Guidelines) in accordance with the *Coal Mine Subsidence Compensation Act 2017*, to support, inform, and guide prospective home builders, property developers, local councils and other stakeholders to mitigate or eliminate the damage to surface structures from mine subsidence within proclaimed mine subsidence districts.

In areas within active mining leases, the development guidelines are designed to effectively balance the interests of property owners and coal mine proprietors, providing mitigation measures against subsidence damage without imposing unreasonable costs and restrictions on the landowner or unreasonably sterilising coal resources.

2. Surface Development Guidelines

One of eight guidelines was applied to each property within a mine subsidence district. The guideline applied depends on the subsidence risks at each property as detailed below:

Guideline 1. Non-active mine workings at risk of pothole subsidence
Guideline 2. Non-active mine workings possible subsidence risk
Guideline 3. Non-active mine workings remote subsidence risk
Guideline 4. Active mining areas – high predicted subsidence impact
Guideline 5. Active mining areas – moderate predicted subsidence impact
Guideline 6. Active mining areas – minimal predicted subsidence impact
Guideline 7. On Application
Guideline 8. No Restrictions

3. Objective of Guideline 2

This guideline explains what home builders and property developers must do in relation to obtaining approval for their development under the:

- *Coal Mine Subsidence Compensation Act 2017* (the Act)
- *Coal Mine Subsidence Compensation Regulation 2017* (the Regulation)

Compliance with this guideline is a requirement for persons planning to develop property within a mine subsidence district that has been assigned **Guideline 2**.

Guideline 2 applies to properties within proclaimed mine subsidence districts assessed by SA NSW to be at risk of damage due to trough subsidence. Trough subsidence forms as a result of the presence of underlying, potentially unstable, abandoned coal mine workings.

The purpose of **Guideline 2** is to:

- prevent or minimise damage to a residential building should subsidence occur on the site
- ensure the residential building remains safe to persons inhabiting the residence

- ensure that when residential construction in abandoned mining affected areas occurs, compliance with the Act and Regulation is as simple and inexpensive for the home builder as practicable.

4. Areas where this guideline applies

Areas subject to Guideline 2 are identified on the NSW Planning Portal at www.planningportal.nsw.gov.au/find-a-property.

Guideline 2 is applied to properties that have been:

- undermined by coal mine workings in the past
- assessed by SA NSW as having the potential to be impacted by subsidence due to historical coal mine workings.

5. Allowable residential construction

Guideline 2 applies to applications for up to two residential buildings that conform with the following description. Commercial buildings or applications for more than two separate residential buildings will be assessed on merit.

The following residential construction is permitted within areas subject to **Guideline 2** without further approval from SA NSW:

Single or two storey brick veneer residential developments erected on reinforced concrete footings/slab to comply with AS 2870. These improvements are limited to a maximum length of 24 metres and maximum footprint size of 400m^2.

- The buildings are to be designed and constructed in accordance with the current editions of AS1684, AS 2870, AS3600, AS3700, AS4773, the Building Code of Australia, any other relevant applicable Australian Standards and good engineering practice. Ignore class “P” under AS2870 on this site.
- Masonry is to be articulated, in accordance with the current editions of Australian Standards AS3700 and AS4773.
- Both slab on ground and lightweight bearers and joists permitted.

The following are not permitted:

- Basements
- Suspended slabs

Masonry internal walls

An application for approval must be lodged in accordance with Section 22 of the Act.

6. Other allowable additions and improvements

SA NSW also allows the below types of additions and improvements on properties subject to **Guideline 2**:

- Concrete / fibreglass swimming pools, both in-ground and above-ground
- Retaining walls designed and constructed in accordance with relevant applicable Australian Standards and good engineering practice.

7. Who can assess whether development complies with Guideline 2

The relevant council or an accredited certifier as defined in the *Environmental Planning and Assessment Act 1979* assesses whether development complies with **Guideline 2**.

8. Proposed developments that do not comply with the guideline

Proposed improvements that do not comply with the guideline for the property must be assessed by SA NSW risk engineers on merit.

Depending on the type of construction and nature of the mine workings, SA NSW may require specific engineering design measures to be applied to the improvement, further geotechnical investigation to better understand the subsidence risk, or stabilisation of the mine workings.

9. Certification requirements

Following construction, a certifier must be engaged to certify that an improvement has been constructed in accordance with **Guideline 2**. A copy of this certification must be provided to SA NSW.

10. How this guideline was developed

SA NSW's development guidelines were developed by SA NSW in consultation with an expert reference group comprising of structural engineers, mining experts and key mining and development industry stakeholders.

11. Disclaimer

Please note SA NSW's surface development guidelines are subject to change.