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5 April 2022
Ref: 1165-Rev B

Mirvac
Level 28, 200 George St
Sydney NSW 2000

Attention: William Hodgkinson

Dear William,

Re: Geotechnical Assessment Report
Proposed Residential Subdivision
Chain-O-Ponds & Northern Roads
Mulgoa NSW

Introduction

This report presents the results of a geotechnical assessment of the subject site, which covers an area of approximately 230 ha, planned for residential development. The assessment is based on a review of aerial photo images, ground contour plans, broad based ground reconnaissance and the findings of geotechnical investigations at nearby locations. This update, Revision B, takes into account the new Street Hierarchy Plan shown on the attached Fig 3.

Based on the above information sources, the assessment presents a generalized geotechnical model in order to gain an appreciation of the development risks and benefits presented by the geological site conditions.

Site Description and Geology

The site, which is bounded by Northern Road and Chain-O-Ponds Road to the east and south respectively, and by a residential development and rural lands to the north and west respectively, previously had been developed for agrarian usage.

An extract for the 'Penrith 1:1000000 Soil Landscape Series Sheet 930' provides the following description of the terrain and subsurface conditions. The soil descriptions used are considered to have an agricultural bias. The Universal Soil Classification used to describe the site soil conditions is preferred and adopted herein:

Landscape: gently undulating rises on Wianamatta Group shales. Local relief to 30m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes. Cleared eucalypt woodland and tall open-forest (dry sclerophyll forest).

Soils: shallow to moderately deep (>100cm) hardsetting mottled texture contrast soils, red and brown podzolic soils (Dr3.21, Dr3.31, Db2.11, Db2.21) on crests grading to yellow podzolic soils (Dy2.11, Dy3.11) on lower slopes and in drainage lines.

Limitations: localized seasonal waterlogging, localized water erosion hazard, moderately reactive highly plastic subsoil, localized surface movement potential.

Past development of the site for agrarian usage has resulted in the construction of a number of farm dams, the locations of which have been integrated with drainage paths which follow natural topography troughs and gullies.

The farm dam locations can be seen on the aerial photo image of the site; Figure 1, and may also be identified from the ground contour plan presented on Figure 2.

Site Subsurface Conditions

As noted above, the predominant landscape comprises rolling low hills, hillcrests, flanking hillsides and gullies/ valleys. The subsurface profile has been interpreted to comprise, in a downward succession: topsoil, silty clays of moderate to high reactivity and thereafter shale or sandstone bedrock.

At the higher ground elevations, comprising hill crests and flanking hillslopes, the total depth of soil cover is estimated to be relatively shallow and possibly up to 1.5 to 2.0m in depth.

The strength of the residual clay horizon is estimated to fall into the very stiff to hard unconfined compressive strength range. The underlying bedrock for a depth affected by distinct weathering is likely to fall into the very low to low strength range, decreasing in weathering and increasing in strength with depth.

Along the gully and valley floor alignments, the subsurface soil profile is expected to be deeper and comprise topsoil and fluvial silty clay layers over residual silty clays. Further, a noticeable decrease in soil strength could be anticipated due to the effects of ground moisture migration.

The geotechnical model for the site may be summarized as follows:

- Topsoil: silty clay, clayey silt, clayey sand ranging in thickness from 0.1 to 0.5m. The greater depth is confined to the gully or valley formations.
- Silty Clays: Of fluvial and residual origin, varying in thickness from approximately 1 to 4m depending upon landform conditions. Generally of medium to high reactivity with changes in soil suction.
- Bedrock: Shale and sandstone, initially highly weathered and very weak, increasing in strength with depth.

Groundwater

No major groundwater issues are anticipated in view of the general landscape features. Groundwater seepage within the fluvial soil deposits at the gully/valley floors should be anticipated.

Site Stability

The general landscape features do not indicate any landslide issues affecting the site. There is a possibility of localised areas of instability as a result of erosion steepening parts of the flanking hillslopes in the gully/ valley sections, and it is considered that such localized instability can be rectified in the course of normal civil works.

Site Development Activities

Topsoil Stripping: No significant issues are anticipated with this activity. However, as previously noted, a greater depth of topsoil should be anticipated along the natural and modified drainage paths.

Subgrade Preparation: It is important that prior to the commencement of construction activities, such as pavements & placement of structural fill, the subgrade be proof-rolled for the detection and treatment of any soft areas. As all clayey subgrades are prone to softening and disturbance from prolonged rainfall and inadequate run-off provisions, appropriate protection of the subgrade should be provided in order to maintain all weather vehicular access.

Earthworks: It is estimated that site development will involve significant earthworks for which no problematic issues are anticipated. Further, it is reasonable to assume that, apart from the topsoil cover, all the other onsite excavated materials may be reused for structural fill.

Bedrock Excavation: In general, no significant difficulties are envisaged in bulk excavation of bedrock, particularly relating to shale and sandstone. In the event that bedrock of reasonable strength and quality is to be excavated, the adoption of rock sawing in conjunction with hydraulic rock breaker methodology should apply.

Drainage Considerations: It is not anticipated that any need for dewatering will be a requirement, given the topography and geological setting of the site.

Normal surface run-off and groundwater seepage control measures consistent with sound civil construction practice should apply.

Tentative Geotechnical Parameters

Earthworks: All structural fill to be compacted to a density ratio of not less than 98% of Standard Maximum Dry Density and moisture content of $\pm 2\%$ of Standard Optimum Moisture Content.

For pavement base and sub-base layers, the compaction level should be increased to a value of not less than 100% of SMDD. No moisture control requirement for these layers is necessary.

Pavement CBR: A value of 3% may be considered for estimating purposes, but should be verified once subgrade levels have been finalized.

Site Classification: Under the prevailing site conditions, a Site Classification of H1 may be considered but should be reappraised following the completion of the subdivision earthworks.

Building Foundations: The following provisional allowable bearing pressures in foundation design may be used:

- 150kPa: for strip and spread footings founded within the very stiff natural silty clays or controlled fill strata.
- 1000kPa: when founded in low strength bedrock
- 2000 kPa: when founded in medium strength bedrock.

High design bearing pressures may be feasible, subject to detailed geotechnical investigation findings.

Geotechnical Risks

Risk Activity	Rating	Comment
Bedrock excavation. Occurrence of high strength and quality bedrock encountered in confined locations such as trenches, liftwells, basements.	Moderate	Proper evaluation of all geotechnical investigation information should be undertaken by contractors, in order to properly plan and reduce contractors' risk.
Excavation Stability	Moderate	May require geotechnical appraisal and remedial stabilization of faces by shotcrete and rock bolt application.
Soft Ground	Moderate	Likely to occur along established drainage paths. Specific geotechnical investigation required to minimize construction risk.

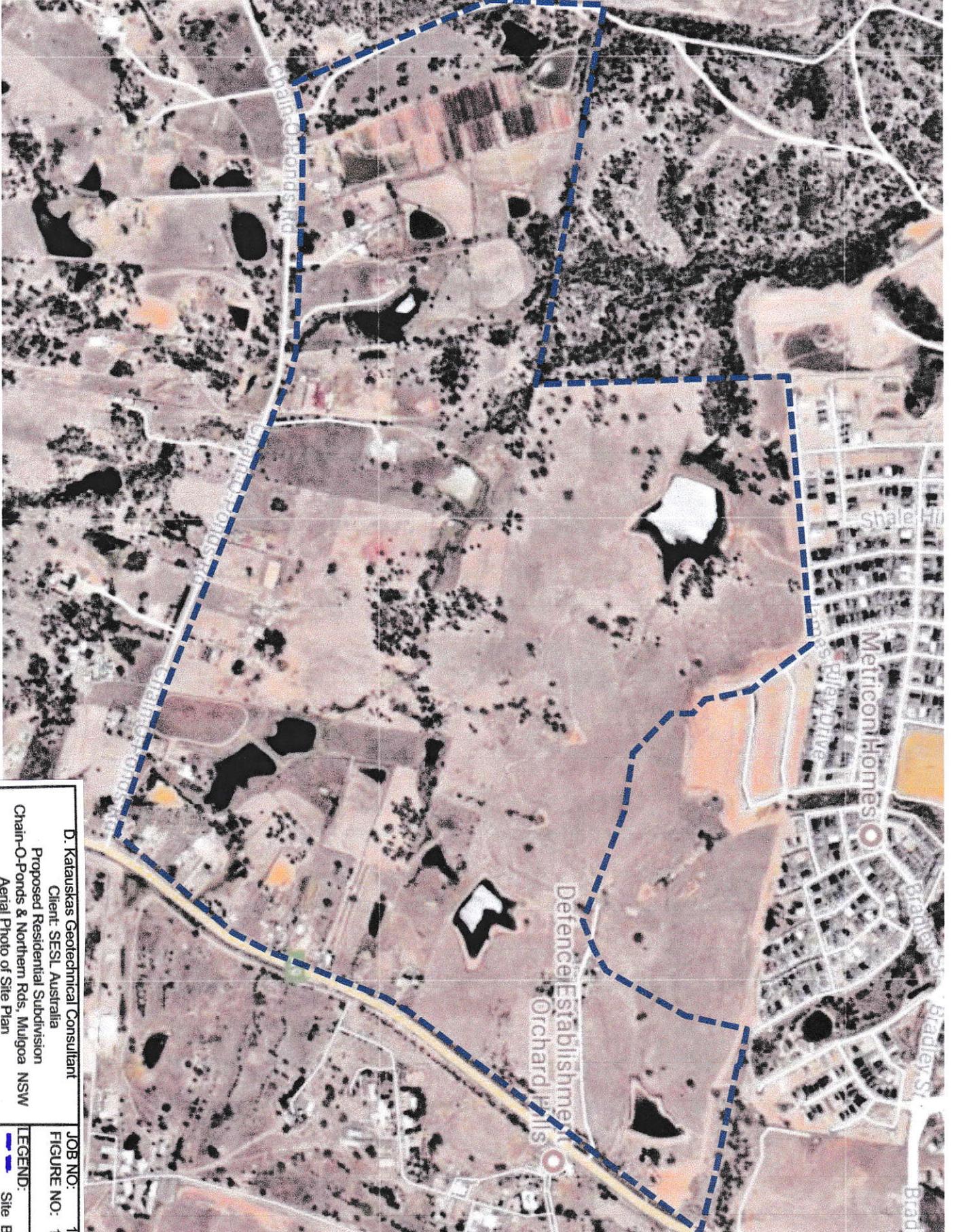
If you have any queries regarding the above please do not hesitate to call me.

Regards,

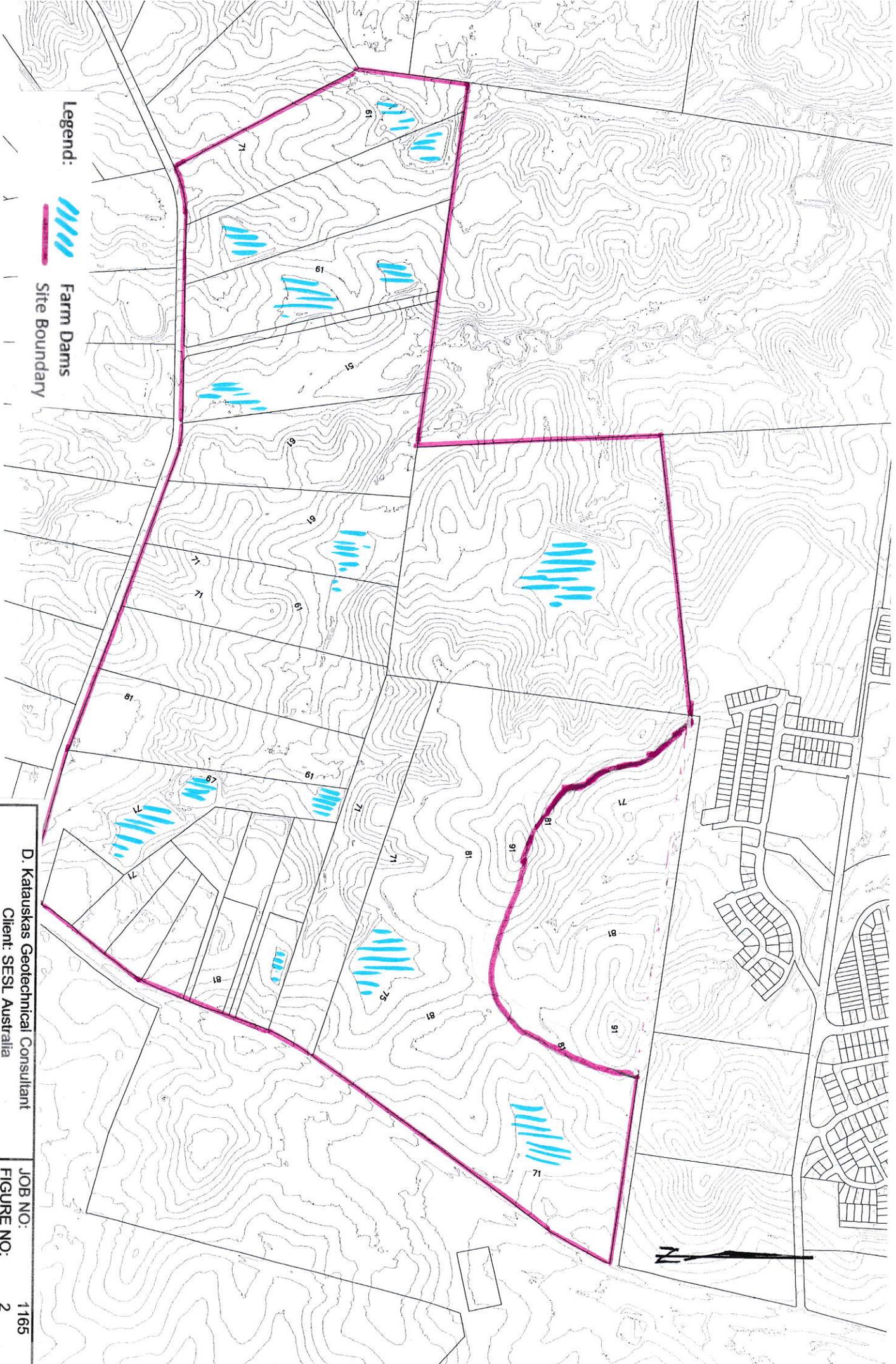


Don Katauskas

encl: Figure 1: Site Plan- Aerial Photo Image
 Figure 2: Site Ground Contours
 Figure 3: Street Hierarchy Plan

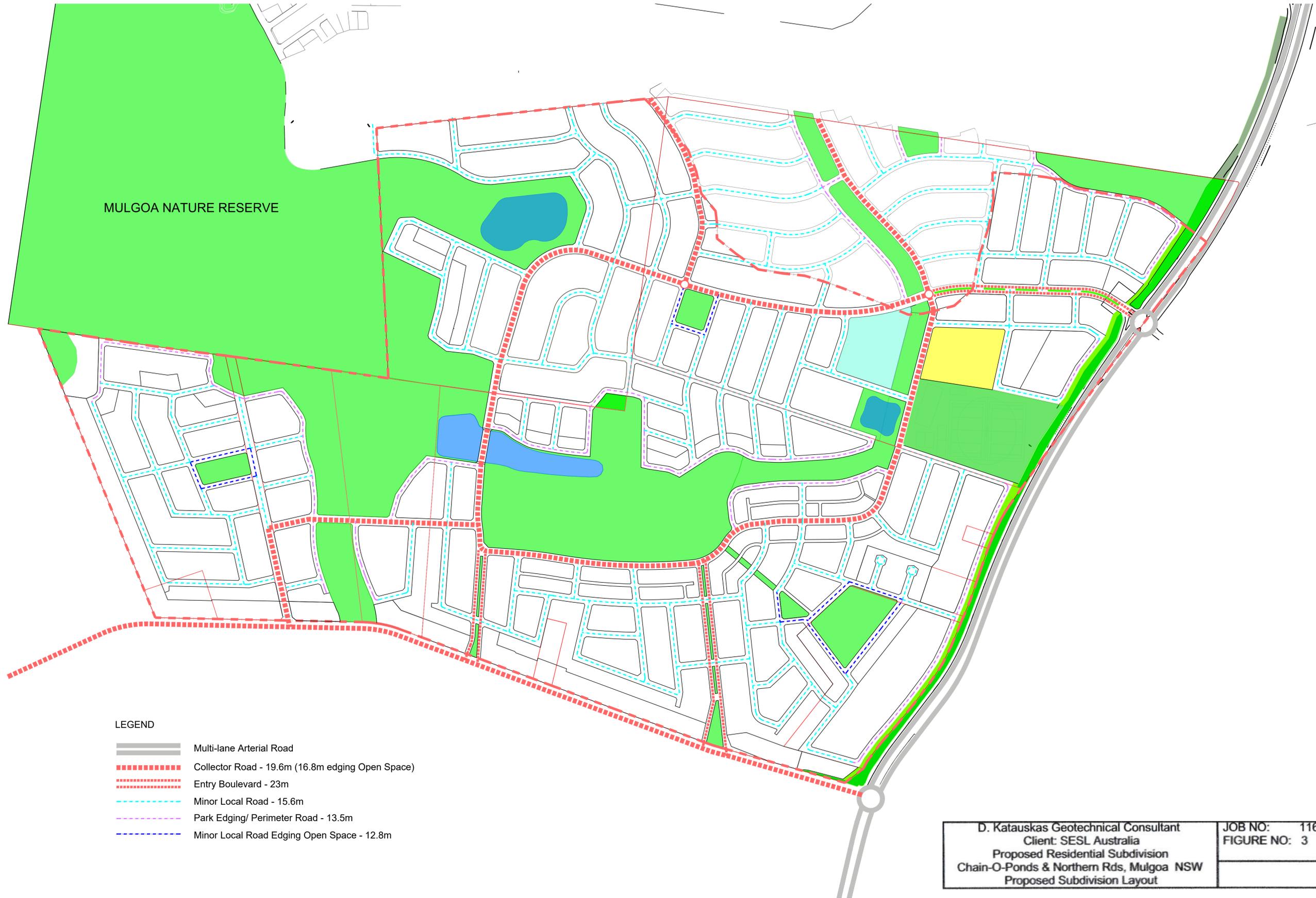


D. Katalauskas Geotechnical Consultant	
Client: SESL Australia	
Proposed Residential Subdivision	
Chain-O-Ponds & Northern Rds, Murrumbidgee NSW	
Aerial Photo of Site Plan	
JOB NO:	1165
FIGURE NO:	1
LEGEND:	
	Site Boundary



D. Katauskas Geotechnical Consultant
 Client: SESL Australia
 Proposed Residential Subdivision
 Chain-o-Ponds & Northern Rds, Mulgoa NSW
 Site Ground Contours

JOB NO:	1165
FIGURE NO:	2

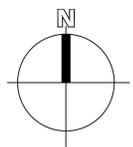


MULGOA NATURE RESERVE

LEGEND

-  Multi-lane Arterial Road
-  Collector Road - 19.6m (16.8m edging Open Space)
-  Entry Boulevard - 23m
-  Minor Local Road - 15.6m
-  Park Edging/ Perimeter Road - 13.5m
-  Minor Local Road Edging Open Space - 12.8m

D. Katauskas Geotechnical Consultant Client: SESL Australia Proposed Residential Subdivision Chain-O-Ponds & Northern Rds, Mulgoa NSW Proposed Subdivision Layout	JOB NO: 1165 FIGURE NO: 3
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New CPCP Boundaries Response

Mulgoa

Chain-O-Ponds & The Northern Road Street Hierarchy Plan

architect:
MIRVAC DESIGN
 architecture
 urban design
 interior design
 graphic design
 Level 28 200 George St
 Sydney NSW 2000
 T 02 9080 8000
 Mirvac Design Pty. Ltd.
 ABN 78 003 359 153



client:
 date 07.04.20 scale @ A1 1:4000
 job no. drawing no. **MP06** rev **E**