

### PRELIMINARY ACID SULFATE SOIL INVESTIGATION

### PROPOSED CUDGEN CONNECTION DEVELOPMENT

November 2023

Prepared For: Cudgen Health Precinct Pty Ltd

Lot 6 DP 727425 741 Cudgen Road Cudgen NSW

HMC2022.445.04

### RE: Lot 6 DP 727425 741 Cudgen Road, Cudgen NSW.

HMC Environmental Consulting Pty Ltd is pleased to present our report for a Preliminary Acid Sulfate Soil Investigation for the abovementioned site.

We trust this report meets with your requirements. If you require further information, please contact HMC Environmental Consulting directly on the numbers provided.

HMC Environmental Consulting Suite 29, Level 2, 75-77 Wharf Street PO Box 311 Tweed Heads NSW_2485		PH: Email: Web: ABN:	0755368863 admin@hmcenvironment.com.au www.hmcenvironment.com.au 60 108 085 614
Title:	Preliminary Acid Sulfate S	Soil Inves	stigation
Job No: 2022.445.04			
Client:	Cudgen Health Precinct I	Pty Ltd	

Document Record:				
Version	Date	Prepared by	Checked by	Approved for issue by
Draft Issue A	04.01.2023	MT	SV	SV
Draft Issue B	17.01.2023	MF	КН	
Final Issue A	27.11.2023	MF	MT	КН

Distribution List	Date	Version	Comments
Planit Consulting	05.01.2023	Draft Issue A	For review
Planit Consulting	17.01.2023	Draft Issue B	Amendments following review
Planit Consulting	27.11.2023	Final Issue A	For lodgment

This report should be cited as '*HMC Environmental Consulting (2023). Preliminary Acid Sulfate Soil* Investigation, Proposed Cudgen Connection Development: - Lot 6 DP 727425 741 Cudgen Road, Cudgen NSW. Report No. HMC2022.445.04."

COPYRIGHT

© HMC Environmental Consulting Pty Ltd, 2023

All intellectual property and copyright reserved.

Apart from any fair dealing for the purpose of private study, research, criticism, or review, as permitted under the Copyright Act, 1968, no part of this report may be reproduced, transmitted, stored in a retrieval system, or adapted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without written permission. Enquiries should be addressed to HMC Environmental Consulting Pty Ltd.



### **EXECUTIVE SUMMARY**

The Cudgen Connection development is proposed on an existing agricultural property located at 741 Cudgen Road, Cudgen NSW. The proposed development is to create a health precinct adjacent to the new Tweed Valley Hospital and would comprise a range of health-related facilities and accommodation, along with community and recreation facilities. There is currently an existing dwelling located on the site and several farm sheds, and ancillary structures which would be removed post rezoning to accommodate the proposal. The site is located on predominately elevated land, commonly referred to as the Cudgen Plateau. The land elevation ranges from approximately RL 4.07m AHD to RL 18.96m AHD.

The site and surrounds are mapped as Class 5 acid sulfate soil (ASS), and disturbance of ASS would not be expected.

Following a desktop assessment of the NSW acid sulfate soil planning, soil landscape, and geology mapping, together with a detailed site inspection, it is concluded that no ASS would be disturbed with the proposed development. The base of the maximum excavation is expected to be approximately RL 4-5m AHD, a minimum 3m above the expected elevation of ASS, where present. The topography, soil landscape and geology mapping does not indicate the presence of ASS on the site. It does not appear, based on likely proposed earthworks, that groundwater drawdown would occur, impacting on off-site ASS.

Acid sulfate soil has not have been identified as being a constraint to the proposed development proposed to be located at Lot 6 DP 727425 741 Cudgen Road, Cudgen NSW.

No further investigation or management is required.



### **TABLE OF CONTENTS**

EXE	CUTIVE SUMMARY	3
1	INTRODUCTION	5
2	SITE INFORMATION	5
3	PROJECT DESCRIPTION	6
4	PROPOSED EARTHWORKS	7
5	TWEED LOCAL ENVIRONMENT PLAN 2014	7
6	GEOLOGY & SOIL LANDSCAPE	8
7	ASS ELEVATION	. 10
8	GROUNDWATER ELEVATION AND DEWATERING	. 10
9	ASS CONCLUSION	. 10
10	SIGNATURE	. 11
11	LIMITATIONS	.11
12	REFERENCES	.12
13	APPENDICES	.12
APP	ENDIX 1 - LOCATION MAPS	13
APPE APPE	ENDIX 2 - SITE PLAN PROPOSED DEVELOPMENT ENDIX 3 - ELEVATION OF ASS IN NSW (WILSON ET AL FIG. 2)	16 18



### **1 INTRODUCTION**

The Cudgen Connection development is proposed on an existing agricultural property located at 741 Cudgen Road, Cudgen NSW. The proposed development is to create a health precinct adjacent to the new Tweed Valley Hospital and would comprise a range of health-related facilities and accommodation, along with community and recreation facilities. There is currently an existing dwelling located on the site and several farm sheds, and ancillary structures which would be removed post rezoning to accommodate the proposal. The site is located on predominately elevated land, commonly referred to as the Cudgen Plateau. The land elevation ranges from approximately RL 4.07m AHD to RL 18.96m AHD.

The site and surrounds are mapped as Class 5 acid sulfate soil (ASS), and disturbance of ASS would not be expected. The maximum excavation depth would not be expected to extend below RL4-5m AHD.

This report addresses an investigation to determine the presence of, and any measures to be implemented to ameliorate any existing acidity or acid generation due to the possible disturbance of acid sulfate soils during construction of the proposed development.

		Table 1 – Project Summary	
Street Address		741 Cudgen Road, Cudgen NSW	
Allotment Description		Lot 6 DP 727425	
Allotment size		5.7 Hectares	
Property No.		4467	
Local Government		Tweed Shire	
Parish		Cudgen	
County		Rous	
Geographical Coordinates		Easting: 555250.31 m E	
(MGA Zone 56)		Northing: 6873231.78 m S	
		(Approximate centre of site).	
Zoning		RU2 Rural Landscape	
Land use - Existing		Residential (existing dwelling), vacant agricultural, and former	
		nursery	
Land use - Proposed		Cudgen Health Precinct including hospital/health uses as well	
		as residential, retail/commercial and recreational uses.	
Site Services		Power, Water, Sewage	
No	North	Uncleared native and regrowth bushland.	
	East	Tweed Valley Hospital (Under construction)	
Surrounding land uses	South	Residential, Agricultural (livestock grazing, sugar cane	
		cropping)	
	West	Residential, Agricultural (livestock grazing, sugar cane	
		cropping)	
Closest Sensitive Environm	ent	Stormwater would flow generally north towards existing	
		agricultural drains offsite, with discharge eventually into	
		Tweed River approximately 3km north-west of the site.	
Topography		Moderate sloping north	
		Northern aspect towards away from Cudgen Road	
		Approximately RL 4.07m AHD to RL 18.96m AHD across the	
		site	
		(Site Survey – B & P Surveys 2022)	

### **2 SITE INFORMATION**



Regional Geology (Hashimoto el al	Bedrock Geology
2008)	Tv: Tertiary volcanic rocks: basalt, rhyolite, trachyte, gabbro,
	syenite
Soil Landscape (Morand, 1996)	Cudgen (cu) soil landscape (Expected)
	Well-drained Krasnozems. Table 4.1 shows no acid sulfate
	potential.
Australian Soil Classification	Ferrosols (FE)
	Soils with B2 horizons which are high in free iron oxide, and
	which lack strong texture contrast between A and B horizons
	I hese soils are almost entirely formed on either basic or
	ultrabasic igneous rocks, their metamorphic equivalents, or
	alluvium derived therefrom. Although these soils do not
	occupy large areas in Australia, they are widely recognised and
	often intensively used because of their favourable physical
	properties.
Regional Hydrogeology (15C GIS)	Groundwater vulnerability is mapped as high.
	intercented at < Em depth
	Groupdwater flow direction would generally follow the
	topography of the site and flow north
Groundwater Database Search	The online NSW Office of Water groundwater mapping
	(http://allwaterdata.water.nsw.gov.au/water.stm) shows
	numerous registered groundwater bores within 500m of the
	subject site. The closest registered bore is GW069108
	approximately 120m south and registered for farming use. The
	standing water height is recorded at 16m depth.

### **3 PROJECT DESCRIPTION**

The proposed *Cudgen Connection* Health and Community Precinct would include a large range of healthrelated facilities and accommodation, along with community and recreational facilities, with a focus on providing health services, creating jobs and essential worker housing.

The site has previously been used for agricultural cropping and a commercial nursery business and horticulture (hydroponics). The site is currently used for residential only, with a small timber-framed dwelling located on the southern boundary, alongside a large shed which was formally used in the nursery operation. Other farm sheds and ancillary structures are located generally on the eastern part of the site. The prosed development of the site would include the demolition of the existing structures.

The concept plan provides the following features as per the plan in Appendix 2.

- 1. 3-storey residential units (36 units)
- 1a. Residential shared hub
- 2. 4-storey residential units (56 units)
- 3. 4-storey residential units (56 units)
- 4. 5-storey residential units (70 units)
- 5. 5-storey residential units (68 units)
- 6. Retail
- 7. Childcare centre & play area
- 8. 2-storey retail and community centre



- 9. 5-storey medical hotel
- **10.** 5-storey mental health hospital
- **11.** 7-storey private hospital & suites
- 12. 7-storey university

Also included in the concept plan are three park areas, two swimming pools and BBQ areas for the residential units, a community plaza and associated roadways, carparking, services and amenities.

Access to the site is provided via Cudgen Road to the south, and Tweed Coast Road to the west, with a connection to the Tweed Valley Hospital site to the east.

### **4 PROPOSED EARTHWORKS**

Significant landform modification would be required to achieve design levels for building platforms across this elevated site. Excavation would also be required for installation of basement carparking, footings, services and other infrastructure including stormwater treatment facilities.

No excavation would be expected below approximately RL 4-5m AHD near the northern part of the site.

### 5 TWEED LOCAL ENVIRONMENT PLAN 2014

The NSW Legislation 1:25 000 Acid Sulfate Soil Planning Maps – *ASS\_001* indicates the site is located within a Class 5 area. The Department of Land and Water Conservation (now NSW DPI) ASS Rick Map Ed. 2 1997 *Cudgen 9641 N3* shows the site is outside the area mapped as either low or high probability ASS.

Table 2.1 in the Assessment Guidelines of the Acid Sulfate Soil Manual (ASSMAC, 1998) and Clause 7.1 of Tweed LEP 2014 (TLEP) indicate for each class of land the types of works likely to present an environmental risk if undertaken in the particular class of land. The maps do not describe the actual severity of ASS in a particular area but provide a first indication that ASS **may** be present.



Figure 1 - ASS Planning Map (https://www.legislation.nsw.gov.au/maps.pdf)





Figure 2 – ASS Risk Map (DLWC, 1997)

Clause 7.1 of the TLEP 2014 requires that works proposed in Class 5 areas within 500m of adjacent Class 1, 2, 3 or 4 land that is below 5 metres AHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land, require a preliminary acid sulfate soil assessment prior to consent. A management plan is required should it be confirmed that acid sulfate soil is present above action criteria and likely to be disturbed. If a management plan is required, it must be prepared in accordance with the Acid Sulfate Soil Manual produced by the Acid Sulfate Soil Management Advisory Committee (ASSMAC).

### 6 GEOLOGY & SOIL LANDSCAPE

According to the NSW Department of Land & Water Conservation *Soil Landscapes of the Murwillumbah-Tweed Heads* 1:100 000 Sheet (Morand, 1996), the site is located within a Cudgen (cu) soil landscape: characterised by well-drained Krasnozem soils. Table 4.1 in Morand (1996) shows no acid sulfate potential within this soil landscape.

The 1:25000 *Coastal Quaternary Geology Map - Tweed Heads* (Hashimoto, 2008) shows the site is generally within the **Bedrock Geology** Tertiary volcanic rocks: basalt, rhyolite, trachyte, gabbro, syenite. This site is not within the recent Holocene geology found within the Tweed floodplain and coastal sands where ASS has been intercepted.





Figure 3 – Soil Landscape Map (Source: http://www.environment.nsw.gov.au/eSpadeWebApp/)



Figure 4 - Geology Map (Source Hashimoto et al, 2008)



### 7 ASS ELEVATION

White et al (1997) note that " the top of the sulfidic horizon should be close to where it was last formed, at about mean high tide sea level (about **1m** AHD in eastern Australia). Naylor et al (1998) also conclude following the extensive ASS mapping project across NSW that an " analysis of the relationships between elevation levels (AHD) and soil data established the critical level at which the upper limit of ASS occurs. This is at or less than about **1m** AHD". The 1m AHD benchmark can also be confirmed via the wording of provisions relating to class 5 land and watertable elevation.

Wilson (2005) also reports a maximum elevation of ASS of 1m AHD after reviewing soil investigation results for the NSW ASS mapping program.

The site elevation within the footprint of the proposed development is approximately RL 4.07m AHD to RL 18.96m AHD. The minimum elevation of the excavation would not be expected to be below approximately RL 4-5m AHD. This is a minimum 3m above the estimated maximum ASS elevation.

### 8 GROUNDWATER ELEVATION AND DEWATERING

The final elevation of excavation depth has not been established; however, dewatering would not be expected to lower the groundwater below approximately RL 3-4m AHD. No drawdown of off-site ASS would be expected.

### 9 ASS CONCLUSION

Following a desktop assessment of the NSW acid sulfate soil planning, soil landscape, and geology mapping, together with a detailed site inspection, it is concluded that no ASS would be disturbed with the proposed development. The base of the maximum excavation is expected to be approximately RL 4-5m AHD, a minimum 3m above the expected elevation of ASS, where present. The topography, soil landscape and geology mapping does not indicate the presence of ASS on the site. It does not appear, based on likely proposed earthworks, that groundwater drawdown would occur, impacting on off-site ASS.

Acid sulfate soil has not have been identified as being a constraint to the proposed development proposed to be located at Lot 6 DP 727425 741 Cudgen Road, Cudgen NSW.

No further investigation or management is required.



### **10 SIGNATURE**

This report has been prepared by Mark Tunks of HMC Environmental Consulting, a suitably qualified environmental consultant, in accordance with the *Protection of the Environment and Operations Act 1997, NSW Acid Sulfate Soil Manual 1998* and other relevant statutes, policy and guidelines.

Mark Tunks Principal

28 November 2023 Completion Date

### **11 LIMITATIONS**

Any conclusions presented in this report are relevant to the site condition at the time of inspection and legislation enacted as at date of this report. Actions or changes to the site after time of inspection or in the future will void this report as will changes in relevant legislation.

The findings of this report are based on the objectives and scope of work outlined in Section 1. HMC Environmental has performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties or guarantees expressed or implied, are given. This report does not comment on any regulatory issues arising from the findings, for which a legal opinion should be sought. This report relates only to the objectives and scope of work stated and does not relate to any other works undertaken for the client. The report and conclusions are based on the information obtained at the time of the assessment.

The results of this assessment are based upon site inspections and fieldwork conducted by HMC Environmental personnel and information provided by the client. All conclusions regarding the property area are the professional opinions of the HMC Environmental personnel involved with the project, subject to the qualifications made above. HMC Environmental assume no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of HMC Environmental, or developments resulting from situations outside the scope of this project.



### **12 REFERENCES**

- Acid Sulfate Soil Management Advisory Committee, "Acid Sulfate Soil Manual", Wollongbar, 1998.
- Ahern CR, McElnea A E, Sullivan L A, (2004). Acid Sulfate Soils Laboratory Methods Guidelines. In Queensland Acid Sulfate Soils Manual 2004. Department of Natural Resources, Mines and Energy. Indoorapilly, Queensland, Australia
- Hashimoto T.R & Troedson A.I. 2008 *Tweed Heads 1:100 000 and 1:25 000, Coastal Quaternary Geology Map Series.* Geological Survey of New South Wales, Maitland
- Morand, D.T., Soil Landscapes of the Tweed Heads Murwillumbah 1:100 000 Sheet", 1996.
- Naylor,S.D., Chapman,G.A., Atkinson,G., Murphy,C.I., Tulau,M.J., Flewin,T.C., Milford,H.B., Morand,D.T.1998 *Guidelines for the Use of Acid Sulfate Soil Risk Maps*. 2<sup>nd</sup> ed. Department of Natural
- Sullivan. L. et al, 2018. *National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual*
- White, I. et al, "*Fixing Problems Caused by Acid Sulphate Estuarine Soils*," *In* C. Copeland, C. (Ed.) Ecosystem Management: the Legacy of Science, Halstead Press, Sydney 1995.
- White, I., Melville, M.D., Wilson, B.P., and Sammut, J. 1997 *Reducing Acidic Discharges from Coastal Wetlands in Eastern Australia.* Wetlands Ecology and Management 5 : 55-72
- Wilson, B. (2005). *Elevations of sulfurous layers in acid sulfate soils: What do they indicate about sea levels during the Holocene in eastern Australia?* Catena 45-56

### **13 APPENDICES**

See following pages



## **APPENDIX 1 - LOCATION MAPS**



Figure 1 - Surrounding Area (Source: Nearmap 2022)





Figure 2 – Subject Site (Source: Nearmap 2022)



## DEVELOPMENT

• 0 • 0 . . . .

• •

. . . . . . . . .

# **APPENDIX 2 - SITE PLAN PROPOSED**



### COTTEEPARKER (D



15

SCALE 1: 750 @ A1 SCALE 1: 1500 @ A3

30





### **DEVELOPMENT SUMMARY:**

HEALTH, UNIVERSITY AND MEDICAL HOTEL - APPROXIMATELY 28 829 m<sup>2</sup> RETAIL, CHILDCARE AND COMMUNITY CENTRE - APPROXIMATELY 3709 m<sup>2</sup> ESSENTIAL WORKER HOUSING, APPROXIMATELY 286 UNITS, 24 061 m<sup>2</sup> PARKLAND AND GREEN SPACES - APPROXIMATELY 13 626 m<sup>2</sup>

### **CONCEPT MASTERPLAN**

PROJ. NAME 741 Cudgen Road | PROJ. NO. 20006148 | SHEET NO. 10003 | REV. 04 BIMcloud: CPACLDBIMM01 - BIMcloud/2000/6148 Cudgen Rd Master: 21/11/2023: 5:13 PM

### **APPENDIX 3 - ELEVATION OF ASS IN** NSW (WILSON ET AL FIG. 2)

•

. . . . .





Fig. 2. Stratigraphic characteristics of all ASS profiles. Surface elevation (a), depth to sulfurous materials (b), and elevation of sulfurous materials (c). Error bars are 95% confidence interval of the mean. An asterisk (\*) in similarity matrices indicates that mean difference between landforms is not significant (P<0.05).

