Soils and Contamination Preliminary Site Investigation (PSI)

Thrumster Wastewater Scheme

Port Macquarie-Hastings Council

10 July 2024

→ **The Power of Commitment**

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Executive Summary

Port Macquarie-Hastings Council (Council) is proposing to develop the Thrumster Wastewater Scheme including a new wastewater treatment plant (WWTP), associated pipelines and infrastructure at Port Macquarie on the NSW Mid North Coast (the project). The project has been declared as a State Significant Infrastructure (SSI) and is a priority project for Council to ensure communities have access to necessary resources in a safe and reliable manner.

It is anticipated that construction of the project would commence in 2025, subject to the required planning and regulatory approvals and is anticipated to take 2-3 years. The project is estimated to be operational by 2028.

The project includes:

– New WWTP, including a recycled water plant within Lot 14, DP 1139180 on 433 Fernbank Creek Road, about 6 km west of Port Macquarie Central Business District
– Return treated effluent pipeline to Kooloonbung Creek
– Main access road to the WWTP and a flood-proof, all-weather access road
– New sewer pump stations, sewer rising mains, recycled water mains and a potable water connection
– Upgrade works at identified existing sewer pump stations (SPSs) to reduce the current load on the existing system
– Improvements to site access, optic fibre connection and electricity supply

This a Preliminary Site Investigation (PSI) has been prepared by GHD Pty Ltd (GHD) as part of the project's Environmental Impact Statement (EIS). The PSI assesses the potential contamination issues and identifies feasible and reasonable mitigation and management measures for construction and operation and meets the Secretary's Environmental Assessment Requirements (SEARs).

The scope of work for this investigation comprised desktop review of available existing information and a general inspection of the project site to identify areas of potential contamination concern.

Based on the results of the desktop assessment, the overall likelihood for significant chemical contamination to be present along the proposed project is considered low. There is a high probability of encountering ASS during construction along Segments 1, 2, 3, 4 and beginnings of Segment 5. There is also low Naturally Occurring Asbestos (NOA) potential located in portions of Segment 2, 6 and 7.

It is considered that the risks from disturbance of potential contaminated soils within the project can be managed during the proposed works, by implementation of the following:

– Development of a Contaminated Soil Management Plan to manage any contamination encountered during the demolition and construction of the project and to ensure the completed works are suitable for the intended land use.
– Development of an NOA Management Plan to provide a framework for safely working with NOA encountered during the construction and operation of the project.
– Application of the Acid Sulfate Soil Management Plan for Pipe Infrastructure Installations during excavation works.
– Any future contamination reports should be prepared or reviewed and approved by an appropriately qualified environmental consultant.
– This report is subject to, and must be read in conjunction with, the limitations set out in section 1.5 and the assumptions and qualifications contained throughout the Report.

Contents

Table index

Figure index

Appendices

List of abbreviations

Abbreviation	Definition
ACM	Asbestos Containing Material
ALS	Australian Laboratory Services
ASS	Acid Sulphate Soil
bgl	Below ground level
BTEXN	Benzene, Toluene, Ethyl benzene, Xylenes, Naphthalene
CLM Act	Contaminated Land Management Act 1997(incorporating amendments made by the Contaminated Land Management Amendment Act 2003)
COPC	Chemical of potential concern
CSM	Conceptual Site Model
CSMP	Contaminated Soils Management Plan
EIS	Environmental Impact Study
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EPL	Environmental Protection Licence
mbgl	Metres below ground level
NSW EPA	NSW Environment Protection Authority
Ha	Hectare
ID	Identification
m AHD	Metres Australian Height Datum
m bgl	Metres below ground level
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
NOA	Naturally occurring asbestos
OCP	Organochlorine Pesticide
PACM	Potential Asbestos Containing Material
PAH	Polycyclic Aromatic Hydrocarbon
PC	Power and communications line
PCB	Polychlorinated Biphenyl
POEO	Protection of the Environment Operations
PSI	Preliminary Site Investigation
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
VOC	Volatile organic compounds
WWTP	Wastewater Treatment Plant

1. Introduction

1.1 Overview

1.1.1 Project background

Port Macquarie-Hastings Council (Council) is proposing to develop the Thrumster Wastewater Scheme including a new wastewater treatment plant (WWTP), associated pipelines and infrastructure at Port Macquarie on the NSW Mid North Coast (the project). The project has been declared as a State Significant Infrastructure (SSI) and is a priority project for Council to ensure communities have access to necessary resources in a safe and reliable manner.

The Port Macquarie-Hastings local government area (LGA) covers an area of approximately 3,626 square kilometres and has an estimated population of 86,762 (ABS Census, 2021) spread over 25 townships and localities. Port Macquarie is one of the fastest growing regional cities in NSW with an additional 9,100 new homes required to meet the anticipated growth projections outlined in the North Coast Regional Plan 2041. The population is expected to grow rapidly, reaching 14,200 people over the next 20 years. Population forecasting has predicted that the population within the LGA will grow to 115,302 residents by 2046 (PMHC, 2024), increasing demand on the existing wastewater infrastructure and utilities.

The primary objective for the project is to support recent urban growth in the outer suburbs of Port Macquarie. The new wastewater scheme will reduce demand on the existing Port Macquarie WWTP and improve the resilience, redundancy and ongoing capacity of Council's infrastructure services, and facilitate planned future growth in the identified areas. The scheme would also minimise the environmental impact of wastewater management by implementing reuse of recycled water.

1.1.2 Key features of the project

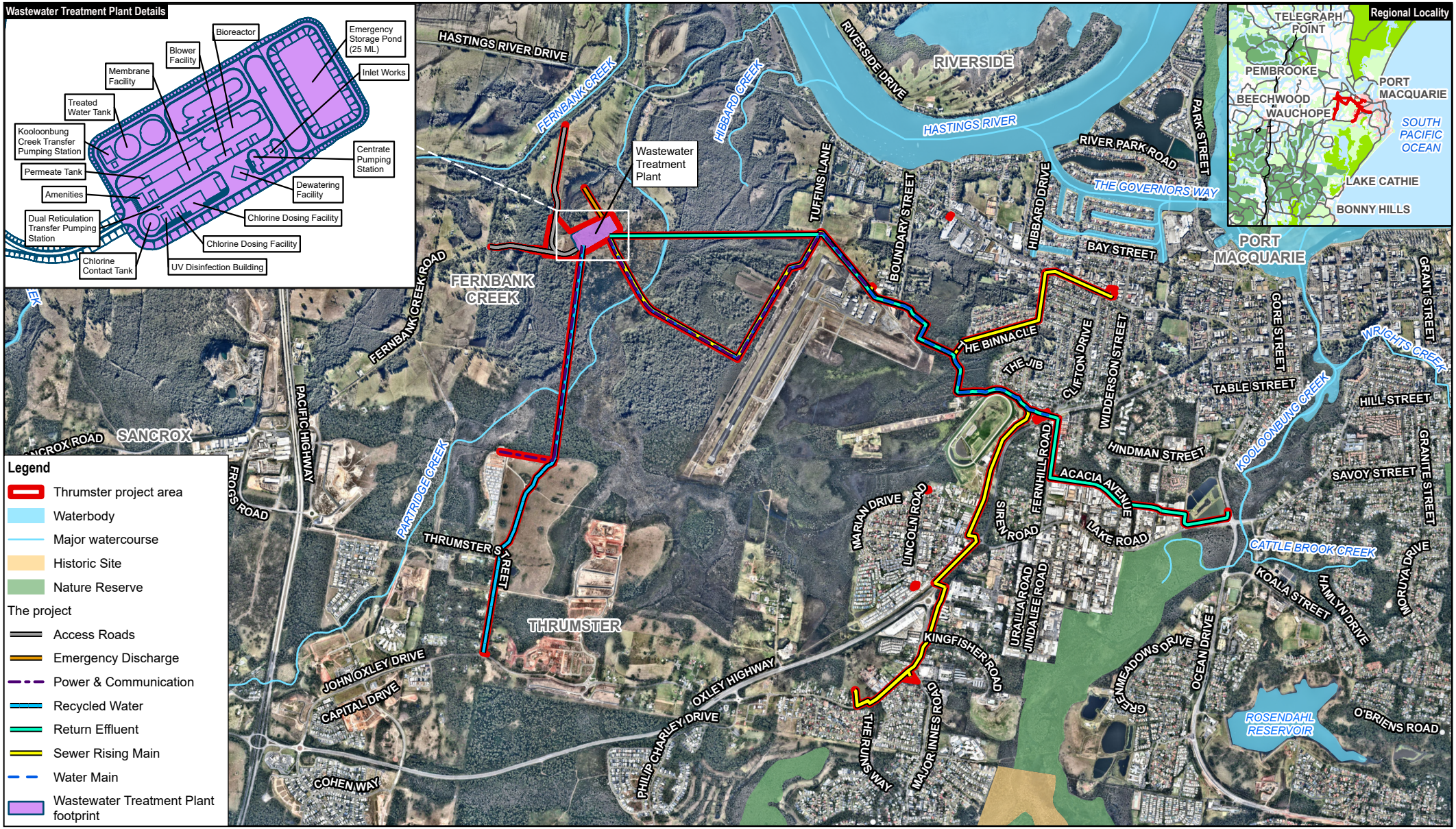
The proposed WWTP is situated within Lot 14, DP1339180 on 433 Fernbank Rd, about 6 km west of Port Macquarie Central Business District. The project, as shown in Figure 1.1 generally includes the following:

– New WWTP, including a recycled water plant within Lot 14, DP 1139180 on 433 Fernbank Creek Road, about 6 km west of Port Macquarie Central Business District
– Return treated effluent pipeline to Kooloonbung Creek
– Main access road to the WWTP and a flood-proof, all-weather access road
– New sewer pump stations, sewer rising mains, recycled water mains and a potable water connection
– Upgrade works at identified existing sewer pump stations (SPSs) to reduce the current load on the existing system
– Improvements to site access, optic fibre connection and electricity supply

It is anticipated that construction of the project would commence in 2025, subject to the required planning and regulatory approvals and is anticipated to take 2-3 years. The project is estimated to be operational by 2028.

Site compounds would be established within close proximity of the WWTP and would be required along the pipeline routes (these are mapped in Project map, Figure 1.1). Each site compound has been chosen as they are cleared of native vegetation, outside of natural drainage lines and do not contain known Aboriginal heritage.

The project is anticipated to be fully commissioned and operational by the end of 2028. The WWTP would have a design capacity of 40,000 EP and hydraulic loading of 9.2 ML/Day by 2039. Thrumster WWTP has been designed to be expandable in the future to an ultimate capacity of 80,000 EP and hydraulic loading of 18.4 ML/Day by 2071. The project incorporates advanced wastewater treatment technology capable of mechanical and biological nutrients reduction, equipped with UV and chlorine disinfection systems to provide multiple barriers against pathogens for the non-potable recycled water. The ultimate recycled water design capacity of 4.7 ML/Day is provisioned for the project.



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Project overview

Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

FIGURE 1.1

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Print date: 26 Jun 2024 - 12:41

Data source: PMHC: Infrastructure data, 2023; BECCA: WTP Design, 2024; Geoscience Australia: 250k Topographic Data Series 3, 2006; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/10/2023.
Created by: fmackay

1.2 Secretary's Environmental Assessment Requirements

The Department of Planning and Environment (DPE) has issued the Secretary's Environmental Assessment Requirements (SEARs) for the project. A description of the SEARs requirements and where they have been addressed in this report is provided in Table 1.1.

Table 1.1 Soils and contamination SEARs

Requirement	Where addressed in this report
Provide details of site history and any details needed to describe the existing situation in terms of soil types and properties and soil contamination	Section 3
Identify any likely impacts resulting from the construction or operation of the proposal, including the likelihood of:	Section 6
A) Disturbing any existing contaminated soil.	
B) Contamination of soil by operation of the activity.	
C) Subsidence or instability.	
D) Soil erosion.	
E) Disturbing acid sulfate or potential acid sulfate soils.	
Describe and assess the effectiveness or adequacy of any soil management and mitigation measures during construction and operation of the proposal including:	Section 6
A) Erosion and sediment control measures.	
B) Proposals for site remediation.	
C) Proposals for the management of these soils including cleaner production processes, contamination treatment and prevention systems.	

1.3 Purpose of report

The purpose of this soils and contamination preliminary site investigation (PSI) is to inform the Environmental Impact Statement (EIS) with regard to the potential contamination issues within the proposed Thrumster Wastewater Scheme (which will include the WWTP) including a recycled water plant, sewer rising main and the recycling main and provide recommendations for management and/or remediation measures to be implemented during construction and operation (if required).

1.4 Scope of works

The scope of work for the PSI included the following:

– Site history review including review of any previous soil and/or groundwater assessment reports.
– Review of geology, hydrology, and topography information for the proposal area.
– Review of NSW Environment Protection Authority (NSW EPA) record of notices and sites notified to the NSW EPA under the Contaminated Land Management Act 1997 (CLM Act) and Protection of the Environment Operations (POEO) Environmental Protection Licence (EPL) Register.
– Review of the Water NSW database on groundwater bore information for the area.
– Review of the online NSW Naturally Occurring Asbestos (NOA) map.
– Review of the online NSW Acid Sulfate Soil (ASS) map.
– Review of publicly available historical aerial photographs.
– Assessment of neighbouring land uses including any potentially contaminating activities.
– A general site inspection of the proposed project to identify areas of potential contamination concern.

– Preparation of this report with reference to NSW EPA 2020 and the National Environment Protection Council NEPC (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as amended 2013 (NEPM) summarising the results of the desktop review, and provision of recommendations for further investigations (as required).

1.5 Limitations and assumptions

This report: has been prepared by GHD for Port Macquarie-Hastings Council and may only be used and relied on by Port Macquarie-Hastings Council for the purpose agreed between GHD and Port Macquarie-Hastings Council as set out in Section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Port Macquarie-Hastings Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

Historical land titles and Council information (Section 10.7 certificates or register of development or building applications) were not reviewed as part of the desktop study. No soil, sediment, surface water or groundwater sampling was completed as part of this desktop study.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Assessment approach

2.1 Legislation and policy context

2.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes a framework for the assessment and approval of developments in NSW. It also provides for the making of environmental planning instruments, including state environmental planning policies (SEPPs) and local environmental plans (LEPs), which determine the permissibility and approval pathway for development proposals and form a part of the environmental assessment process. The project is classified as a SSI in accordance with Division 5.2, Part 5 of the EP&A and requires approval from the NSW Minister of Planning. An EIS has been prepared to assess the impacts of the project in accordance with the issued SEARs. This assessment supports the EIS.

2.1.2 Protection of the Environment Operation Act 1997

The POEO Act provides the legislative framework for the protection and enhancement of the environment in NSW. Its primary objectives are to reduce risks to harmless levels through pollution prevention, cleaner production, application of waste management hierarchy, continual environmental improvement and environmental monitoring.

EPLs are required to undertake a scheduled activities or scheduled development work. Section 5.24 (e) of the EP&A Act states that an authorisation for a consent under Chapter 3 of the POEO Act cannot be refused if it is necessary for carrying out approved SSI and is to be substantially consistent with the approval under this Division.

The project is defined as a scheduled activity for sewage treatment in accordance with Clause 36 of schedule 1 of the POEO Act and therefore would require an environmental protection licence (EPL) for operation of the treatment system. Construction of the WWTP will constitute work being undertaken to enable a scheduled activity to be carried out and will constitute scheduled development works and require an EPL.

2.1.3 Contaminated Land Management Act 1997

The CLM Act is part of the management framework for contaminated land in NSW. The CLM Act enables the NSW EPA to respond to and manage site contamination when it considers that contamination is significant enough to require regulation. Site contamination requires regulation under the CLM Act when a site is declared “significantly contaminated land” (defined as land described in a notice having effect under Section 11 of the CLM Act) or when land is subject to a management order or an approved voluntary management project. Lands within the contamination study area have not been declared “significantly contaminated land” and are not subject to a management order.

The CLM Act outlines the circumstances in which notification to the EPA is required in relation to the contamination of land. This may become relevant during construction of the project if contamination is encountered.

Section 105 of the CLM Act allows the EPA to make or approve guidelines for the purposes connected with the objectives of the CLM Act. Contaminated sites not regulated by the EPA can be managed through the planning process by the relevant planning consent authority.

The EPA holds records of sites that have been notified under Section 60 of the CLM Act or otherwise reported to the EPA. This assessment includes a search of the record of sites held by EPA to identify sites which may impact soil and/or groundwater quality within the construction area.

2.1.4 Guidelines

The PSI is undertaken with reference to the following relevant guidelines made or approved by NSW EPA including those for Preliminary Contamination Investigations:

– Contaminated Land Guidelines: Sampling Design Part 1 – Application (NSW EPA, 2022)

- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA 2020)
- National Environment Protection Measure (Assessment of Site Contamination) (NEPC, 1999) as amended May 2013
- Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd edition), (NSW EPA, 2017)
- Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management (CLM) Act 1997, (DECCW, 2009)

2.2 Methodology

The following key tasks were carried out as part of this PSI:

- A review of relevant legislation, policy and guidelines to address the SEARs and agency requirements.
- A desktop assessment comprising review of existing information, aerial photography and previous ground investigation reports. The review is used to identify current environmental conditions of the study area and potential sources of contamination.
- Site inspections were carried out on 25, 26 and 28 September 2023 and 27 March 2024 to confirm the findings of the background desktop assessment. The inspections involved the observation and recording of terrain, surface condition, topography, vegetative cover, drainage pathways, contaminated land risk areas and surrounding land uses.
- Preparation of a preliminary conceptual site model identifying potential sources, contaminants of potential concern (COPC), pathways and receptors.
- The identification of mitigation measures to eliminate or minimise these impacts.

3. Site description

3.1 Site identification

A summary of identification details and the main features observed during the site inspection of the project footprint are provided in Table 3.1 with reference to the Figure 3.1 to 3.7 and photograph log provided in Appendix B. The site inspection was completed by GHD on the 25, 26 and 28 September 2023 and 27 March 2024. For this report, the project footprint was divided into seven segments as summarised below and shown in Figure 3.1 to 3.7 while the main features are presented in Figure 1.1.

- **Segment 1** – includes the new WWTP footprint including the recycled water plant, main access road, a flood proof all weather access road located west of the WWTP, and the emergency discharge line located northwest of the WWTP.
- **Segment 2** – approximately 3.6 km of the new recycled water main and power and communication (PC) lines south of the new WWTP.
- **Segment 3** – approximately 1.6 km of the new return effluent to Kooloonbung Creek from the WWTP to Tuffins Lane.
- **Segment 4** - approximately 2.6 km of the existing Sewer Rising, the Water Main and PC lines are located southeast of the proposed WWTP facility until it intersects Tuffins Lane.
- **Segment 5** –approximately 3.2 km of the new and existing Sewer Rising Main. It also includes approximately 1.5 km of new Return Effluent Main to Kooloonbung Creek and the Water Main and approximately 500 m of the PC line. It also includes a new SPS located along Tuffins Lane, and existing SPS at 176 and 71 Hastings River Drive.
- **Segment 6** – approximately 3.9 km of the new Sewer Rising Main. It also includes approximately 900m of the new Return Effluent Main to Kooloonbung Creek and the Water Main. Several existing SPS are also located in this segment including the Lincoln Road Newport Village, Major Innes/John Oxley Drive, and John Oxley Drive.
- **Segment 7** - approximately 2.3 km of the new Return Effluent Main to Kooloonbung Creek and approximately 900 m of the new Water Main. It also includes a new SPS along the Oxley Highway near the Port Macquarie Racecourse.

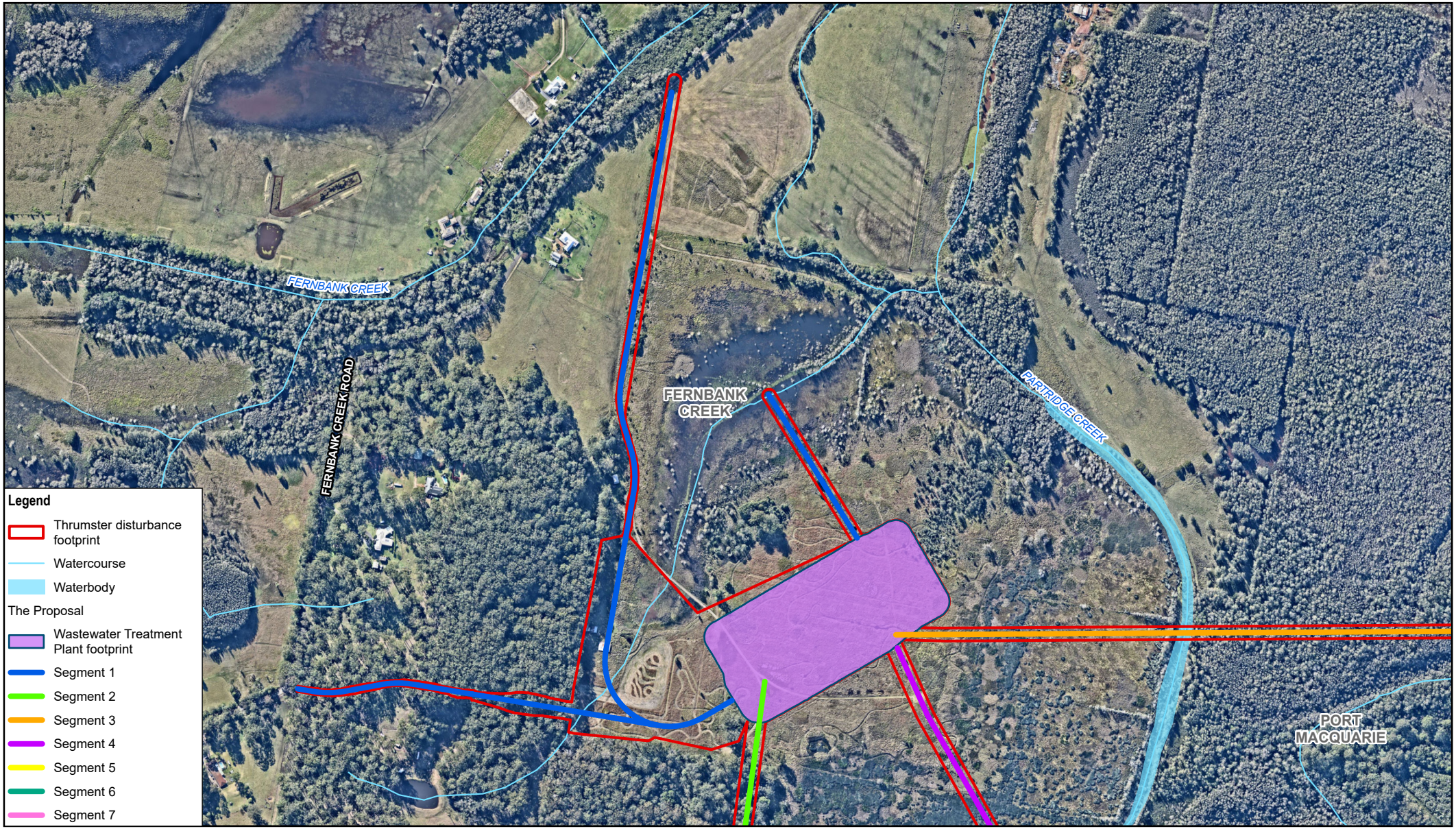
Table 3.1 Site identification summary

Segment Number	Approximate Segment Length/Area	Site Description	Relevant LEP	Zoning
1	12.5 ha	The area for the proposed location of the WWTP and compound is located in the northern portion of the 416 ha Thrumster land owned by Council as shown in Figure 3.1. This segment also includes a 1.2 km access road from the Fernbank Creek Road to the WWTP and a 0.44 m flood-proof all-weather access road from the Fernbank Creek Road to the WWTP which are located north and west of the WWTP, respectively. A 0.3 km Emergency Discharge Line to the wetlands is also located north of the WWTP. The area is currently vacant and covered with grass (Photograph 1 to 5) and surrounded by wetlands and tidal creeks, namely those of Partridge Creek to the east and Fernbank Creek to the north. A swale for water inflow to the wetland is located near the western boundary of the proposed WWTP (Photograph 6), while a hydraulic gate on Partridge Creek which is used to reinstate previous hydrology in the area as part of ASS remediation is located approximately 370 m to its north (Photograph 7 and 8). Partridge Creek is located east of the WWTP between 300 m to 400 m (Photograph 4) while Fernbank Creek is located approximately 800 m north/north-west of the segment. Both creeks drain to the Hastings River located approximately 2.4 km north of the WWTP. Some structures were observed in the western portion (Photograph 2) of the proposed compound but were inaccessible at the time of inspection except for a shed where wastes and containers (with oil, lubricants, pesticides, etc) were observed (Photograph 9). The WWTP and the proposed compound are located in Primary Production (RU1 land Zoning, except for a portion of the proposed compound that lies in an Environmental Conservation Zoned (C2 Zoning) land. This segment includes part Lot 14 DP1139180 and part Lot 13 DP 1139180, and part Lot 10 DP1089078.	Port Macquarie -Hastings Local Environmental Plan 2011	RU1 – Primary Production C2 – Environmental Conservation
2	3.6 km	The segment is located south of the proposed WWTP facility and will be used for the Recycled Water Main and for the PC line as presented in Figure 3.2. Approximately 1.6 km of the segment is located in the undeveloped land and wetlands (Photograph 5). This segment intersects Partridge Creek at 2.1 km. The next 800 m of the segment runs a long an unnamed unsealed access road until it intersects Thrumster Street at 2.7 km Photograph 11). The segment ends at the intersection between Thrumster Street (Photograph 12) and John Oxley Drive at 3.4 km. A satellite compound is located at 1.6 km of the segment from the WWTP facility. In addition, approximately 425 m of the PC line turns west from this area until it ends at the retirement facility (Photograph 10). The first 0.1km of this segment (from the WWTP location) is zoned as RU1 – Primary Production, followed by 1.4 km of the segment zoned as C2 – Environmental Conservation, and approximately 0.4 km zoned for C3- Environmental Management. The rest of the segment is located in an area zoned as residential (R1 and R5). This segment passes through part Lot 14 DP1139180, part Lot 13 DP1301758, and part Lot 12 DP1301758.	Port Macquarie -Hastings Local Environmental Plan 2011	RU1 – Primary Production C2 – Environmental Conservation R1 – General Residential R5 – Large Lot Residential C3 – Environmental Management

Segment Number	Approximate Segment Length/Area	Site Description	Relevant LEP	Zoning
3	1.6 km	This segment covers approximately 1.6 km of the Return Effluent Main to Kooloonbung Creek located east of the WWTP, which traverses the associated wetlands with Partridge Creek and ends at Tuffins Lane as shown in Figure 3.3 (Photograph 4). The segment and surrounding areas are currently zoned as C2 – Environmental Conservation except for the first 100m of the segment from the WWTP location zoned as RU1-Primary Production and the last 100 m of the segment which is located within the Port Macquarie Airport that is currently zoned as SP2 – Infrastructure. This segment intersects Partridge Creek at 380 m and an unnamed tributary at 1 km which both drain to the Hastings River. This segment passes through part Lot 14 DP1139180, part 239 DP754434, part Lot 104 DP754434, part Lot 203 DP754434 and part Lot 25 DP1123026.	Port Macquarie -Hastings Local Environmental Plan 2011	RU1 – Primary Production C2 – Environmental Conservation SP2 - Infrastructure
4	2.6 km	This segment is approximately 2.6 km and length and includes the Sewer Rising Main and portions of the Return Effluent Main to Kooloonbung Creek, the Water Main and the PC line located southeast of the proposed WWTP facility as shown in Figure 3.4 (Photograph 4. The first 1.4 km length of the segment (from the WWTP) runs southeast and traverses associated wetlands with Partridge Creek which is zoned as C2 – Environmental Conservation. The segment then turns towards the North and end at Tuffins Lane. The majority of the segment is zoned as C2 – Environmental Conservation except for the first 180m of the segment from the WWTP location that is currently zoned as RU1-Primary Production and the last 1.2 km of the segment that is also zoned as SP2 – Infrastructure. This segment intersects Partridge Creek at 450 m and the unnamed tributary to the Hastings River at 1.6 km. The last 1.2 km of the eastern portion of this segment, located adjacent of the airport was inaccessible at the time of site inspection. This segment passes through part Lot 14 DP1139180, part 238 DP754434, part Lot 4 DP115306, part Lot 239 DP754434 and part Lot 25 DP1123026.	Port Macquarie -Hastings Local Environmental Plan 2011	RU1 – Primary Production C2 – Environmental Conservation SP2 - Infrastructure
5	3.2 km	This segment is approximately 3.2 km in length and includes the Sewer Rising Main, Water Main and the PC Line as shown in Figure 3.5. The segment runs along Tuffins Lane and intersects Boundary Street at 650 m. It then turns to the south along an unsealed access road and passes through bush land (Photographs 20 and 21). It then turns northeast and runs along The Binnacle (Photograph 19) and Kemp Street (Photograph 18) before turning east/south-east along Hastings River Drive (Photograph 16). The segment ends at the Council pump station and former scrap yard and fuel storage. (Photograph 17). Another existing SPS is located at 176 Hastings Drive located 850 m north-west of the Sewer Rising Main and a new SPS along Tuffins Lane. The Port Macquarie Airport is located adjacent south of the portion of the segment that runs along Tuffins Lane. An unnamed tributary which drains to the Hastings River is intersected by the project at 200 m.	Port Macquarie -Hastings Local Environmental Plan 2011	SP2 – Infrastructure SP4 – Enterprise C2 – Environmental Conservation R1 – General Residential E3 – Productivity support RE1 – Public Recreation

Segment Number	Approximate Segment Length/Area	Site Description	Relevant LEP	Zoning
		The first half of the western portion of the segment that is located adjacent to the airport (Photograph 13) is generally located in areas zoned as SP2 – Infrastructure or SP4 – Enterprise, while majority of the next half of the segment is generally located in areas zoned as R1 – General Residential. Some portions that are located in the bushland are currently zoned as C2 – Environmental Conservation with some area declared as a Biological Stewardship Site (Photograph 20). Some part of the segment located along Hastings River Drive including two of the existing SPS are zoned as E3 – Productivity support. Some areas along The Binnacle and Kemp Street are also zoned as RE1 – Public Recreation. The first 150 m of the segment appears to be unsealed, while the rest of segment runs along bitumen roads with surrounding areas used for residential, recreational and commercial/industrial areas. Two wetlands are located along The Binnacle. This portion of the segment between Tuffins Lane and The Binnacle was inaccessible during the site inspection. This segment passes through part Lot 121 DP1156615, part Lot 2 DP547484, part Lot 25 DP1123026, Lot 24, 25 DP579278, part Lot 12 DP 867928, Lot 1 DP808448 and part Lot 12 DP 874058.		
6	3.9 km	This segment is approximately 3.9 km and includes the new Sewer Rising Main and portions of the new Return Effluent Main to Kooloonbung Creek and the Water Main as presented in Figure 3.6. Several existing SPS are also located in this segment including those located at the Lincoln Road Newport Village, Major Innes/John Oxley Drive, and John Oxley Drive. The majority of the segment runs along runs along bitumen roads including Lady Nelson Drive, Tulloch Road, Sherwood Road, Oxley Highway and John Oxley Drive except for some areas near the racecourse (Photograph 23). The portion of the segment located near the racecourse is currently zoned for RE2 - private recreation, while the rest are either zoned for RE1-Public Recreation, RU1 – Primary Production or R1- General Residential. An unnamed tributary to the Hastings River intersects the segment at approximately 3.9 km of the segment. This segment passes through part Lot 6 DP790668, part Lot 653 DP43940, part Lot 678 DP722658, Lot 2 DP234501, Lot 1 DP772163, Lot 1 DP1295248, part Lot 2 DP1295248 and part Lot 22 DP1046267.	Port Macquarie -Hastings Local Environmental Plan 2011	RE2 – Private recreation RE1 – Public Recreation R1 – General Residential RU1 – Primary Production

Segment Number	Approximate Segment Length/Area	Site Description	Relevant LEP	Zoning
7	2.3 km	This segment is approximately 2.3 km and includes the Return Effluent Main to Kooloonbung Creek and portions of the Water Main as presented in Figure 3.7 and ends at the aeration ponds of the existing WWTP (Photograph 28). The majority of the segment runs along bitumen roads including Fernhill Road, Acacia Avenue, Barton Crescent and Lake Road except for some areas near the racecourse and a portion of the segment between Acacia Avenue and Barton Crescent. It also includes a new SPS located along the Oxley Highway near the Racecourse. The majority of the area located adjacent north of the segment between Acacia Avenue and Barton Crescent are zoned as C2 – Environmental Conservation. The rest of the area surrounding the segment are zones for either R2 – Low Density Residential, C4 – Environmental Living, R1 – General Residential, E4 – General Industrial, C2 - Environmental Conservation or SP2 – Infrastructure. The areas surrounding the segment are a mixture of residential areas, recreational areas, and commercial/industrial areas. An unnamed tributary to Kooloonbung Creek intersects the segment at 1.4 km. This segment passes through part Lot 6 DP790668, part Lot 7030 DP1029359 and part Lot 7307 DP1154392.	Port Macquarie -Hastings Local Environmental Plan 2011	R2 – Low Density Residential C4 – Environmental Living R1 – General Residential E4 – General Industrial C2 - Environmental Conservation E3 – Productivity Support SP2 - Infrastructure



Sheet Index

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Zoomed segments
Segment 1

Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

FIGURE 3.1

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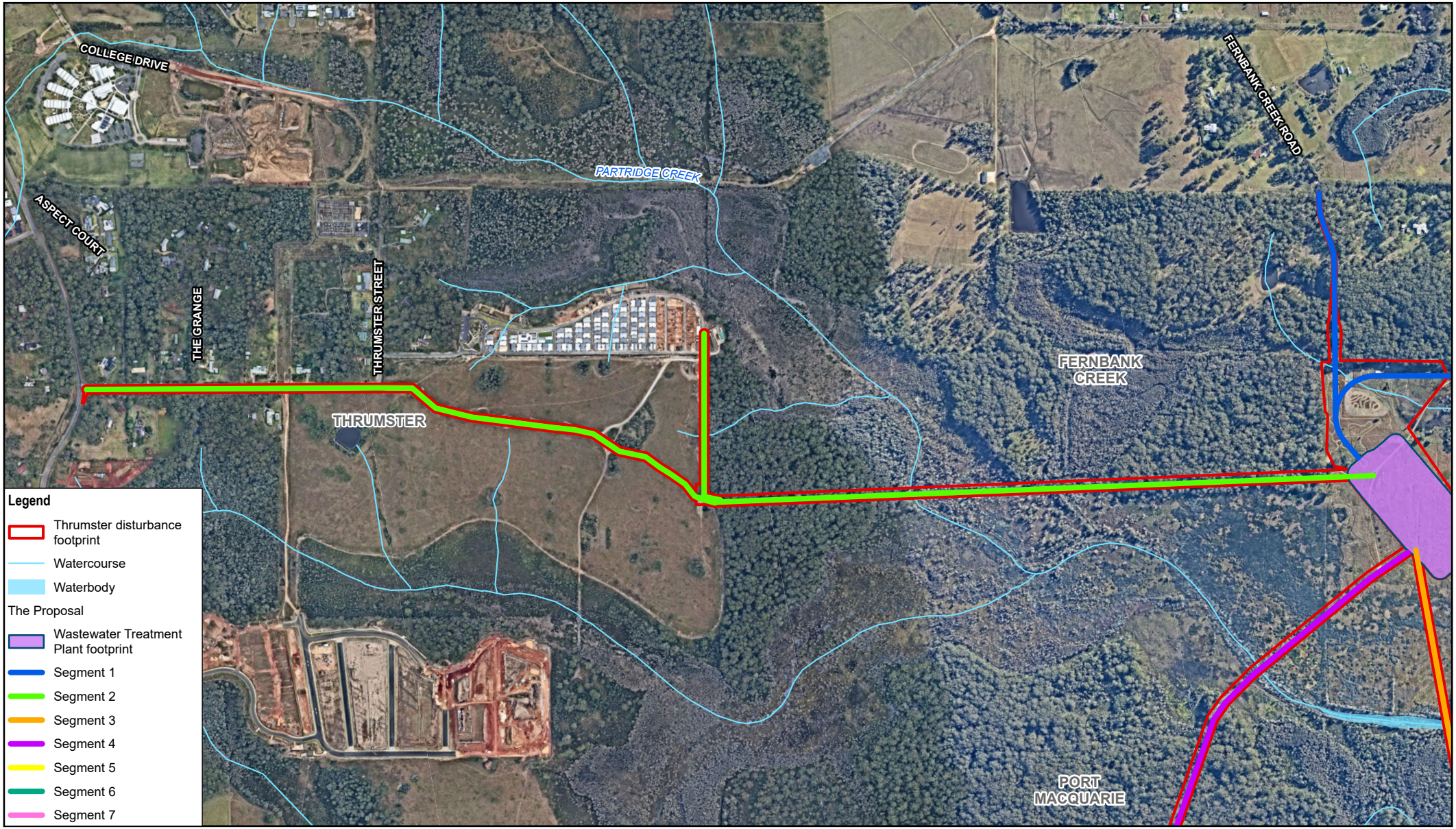

Sheet Index

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

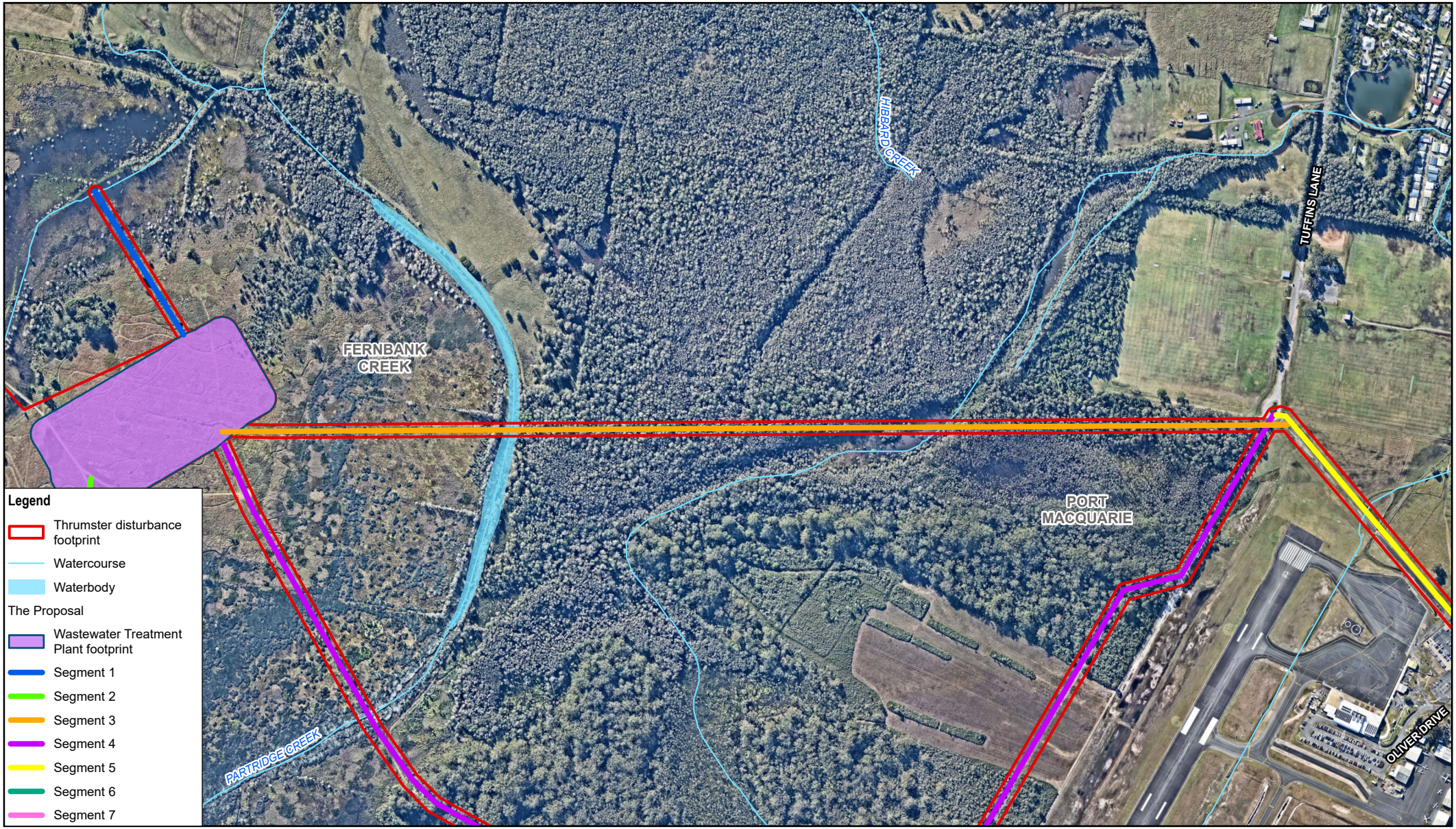
Zoomed segments
Segment 2

Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

FIGURE 3.2

N:\AU\Newcastle\Projects\22\12587218\GIS\Maps\12611129_Thrumster_Contam_PSI.aprx
Print date: 26 Jun 2024 - 12:42

Data source: PMHC: Infrastructure data, 2023; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/12/2023. Created by: fmackay



Sheet Index

Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Zoomed segments
Segment 3

Project No. 12611129
Revision No. 0
Date 26/06/2024

FIGURE 3.3

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Print date: 26 Jun 2024 - 12:42

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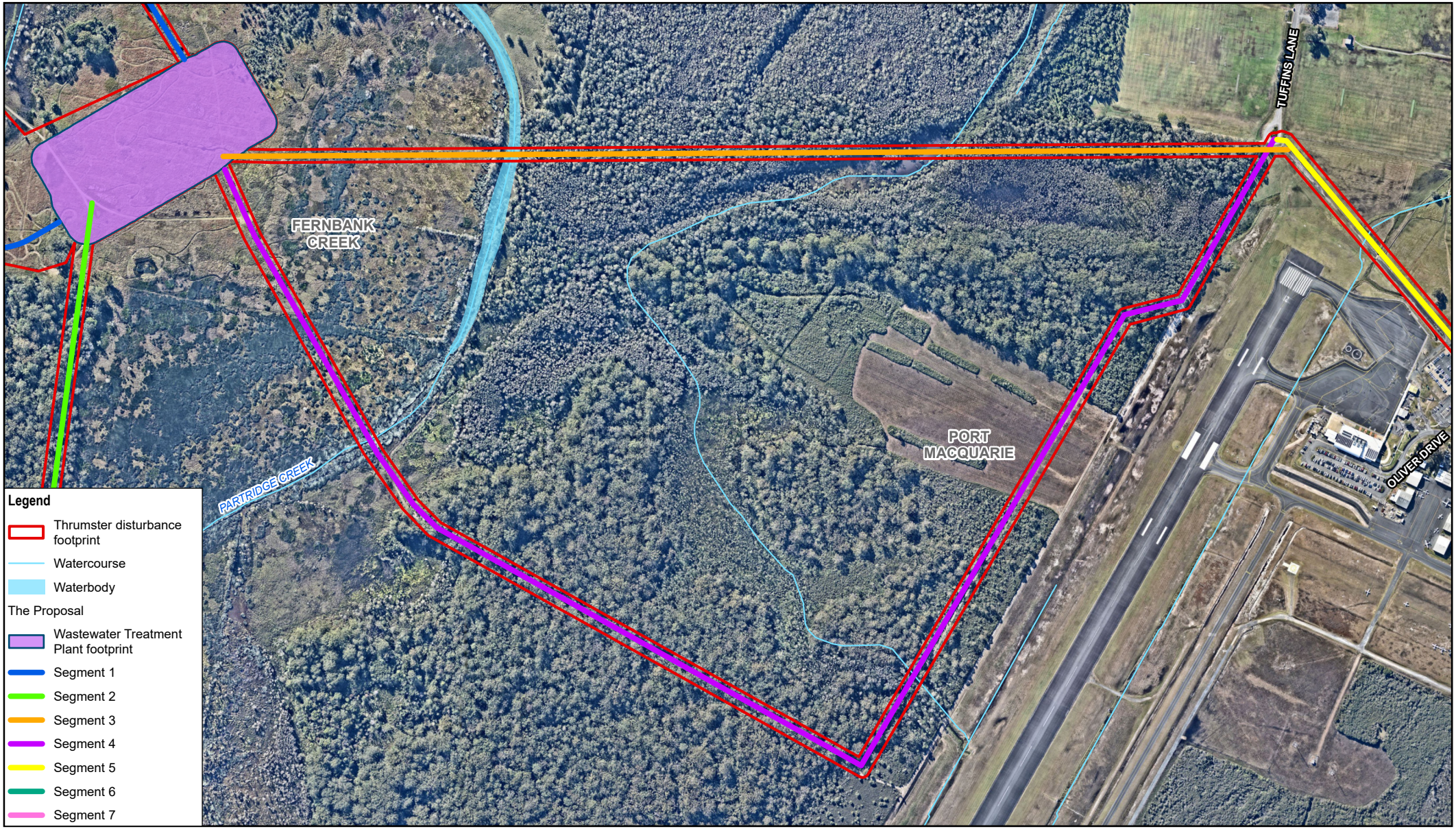

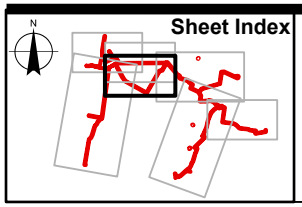

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Zoomed segments
Segment 4

Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

FIGURE 3.4

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Print date: 26 Jun 2024 - 12:42

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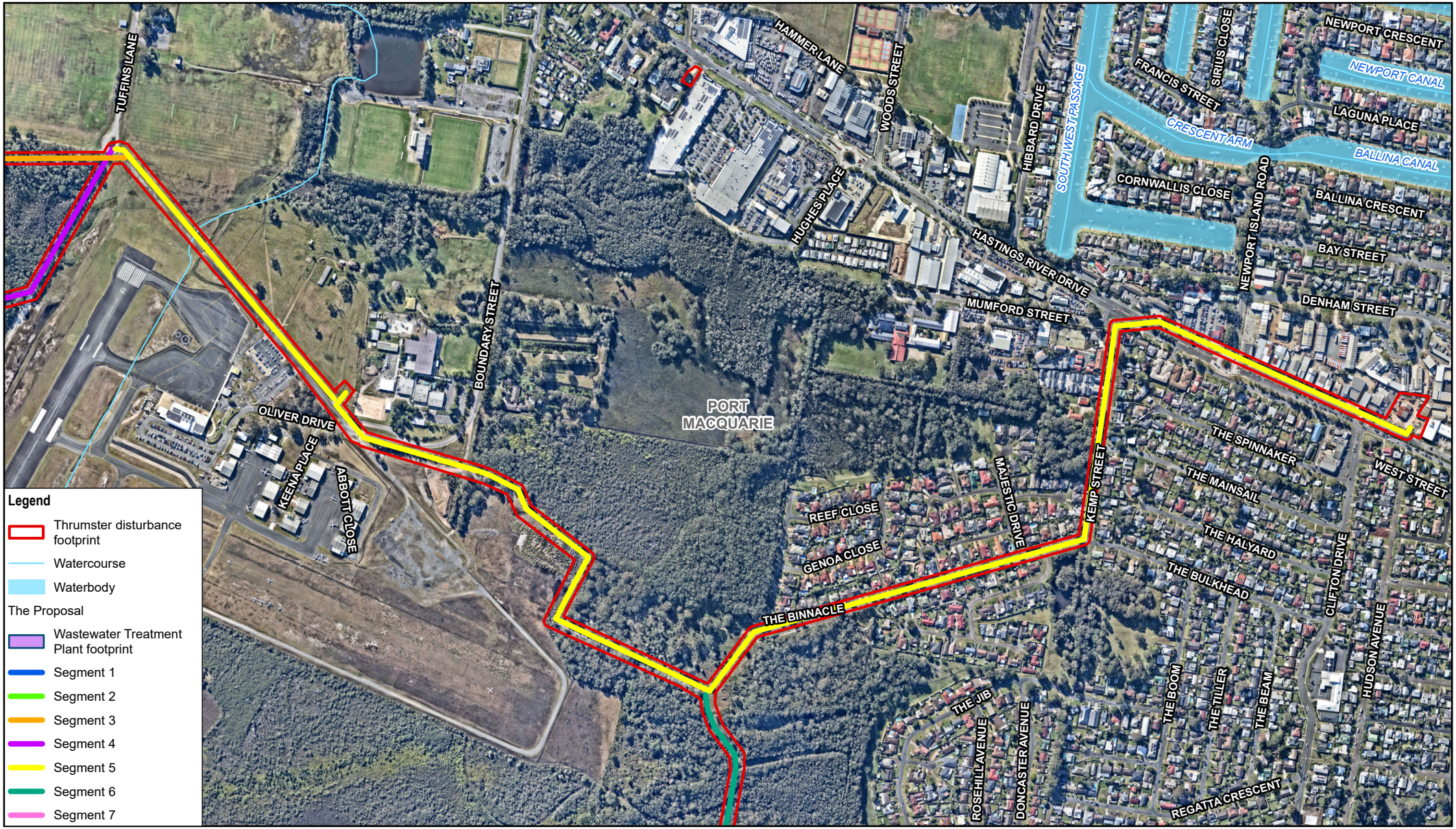

Sheet Index

Paper Size ISO A4

0 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Zoomed segments
Segment 5

Project No. 12611129
Revision No. 0
Date 26/06/2024

FIGURE 3.5

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Data source: PMHC: Infrastructure data, 2023; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/12/2023. Created by: fmackay

Sheet Index

Paper Size ISO A4

0 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Zoomed segments
Segment 6

Project No. 12611129
Revision No. 0
Date 26/06/2024

FIGURE 3.6

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Data source: PMHC: Infrastructure data, 2023; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/12/2023. Created by: fmackay

Sheet Index

Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Zoomed segments
Segment 7

Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

FIGURE 3.7

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Print date: 26 Jun 2024 - 12:42

Data source: PMHC: Infrastructure data, 2023; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/12/2023. Created by: fmackay

3.2 Environmental setting

Table 3.2 provides an overview of the environmental setting of the project area as obtained from publicly available information including applicable data from the site GHD GIS Web Map database.

Table 3.2 Site environmental setting

<table>
<tr><th>Setting</th><th>Site conditions</th></tr>
<tr><td>Topography</td><td>The Thrumster WWTP plan and pipelines route encompasses a range of topographies, all of which are measured with respect to the metres Australian Height Datum (mAHD) (Six Maps, NSW Government, https://maps.six.nsw.gov.au/, accessed 8 September 2023) as summarised below:
– Segments 1, 3 and 4 – these segments are located in a relatively flat area with elevation <10 mAHD. Based on the 2008 Geotechnical Investigation (Coffey, 2008a), these segments contains extensive swamp areas of low relief (0 - 3°) and an elevation <2 mAHD.
– Segment 2 – this segment is located in an area between <10 mAHD to 20 mAHD. The first 1.6 km of the segment (from the WWTP) are in area <10 mAHD. Some rises and falls between 10 mAHD to 20 mAHD are then located further south of the segment, with the elevation rising up along Thrumster Street to a maximum elevation of 20 mAHD.
– Segment 5 – This segment is relatively flat with elevation <10 mAHD, with portions of the segment along the Binnacle to Hastings River Drive having an elevation between 4 to 6 mAHD.
– Segment 6 - this segment is located in an area between <10 mAHD to 20 mAHD. The elevation of the area generally rises to the east (from the racecourse towards Oxley Highway). Along the segment, rises and falls on the elevation of the segment from north to south are present.
– Segment 7 – this segment is located in an area between <10 m AHD to 30 mAHD. The first 0.3 km of the segment rises from 10 mAHD to a maximum elevation of 18 mAHD towards Oxley Highway, and then continue to decrease in elevation up to 2 mAHD towards Kooloonbung Creek.</td></tr>
<tr><td>Hydrology</td><td>The main hydrological features that intersect or run adjacent to the proposed Cowarra WTP and pipelines are summarised below.
<table>
<tr><th>Hydrological Feature</th><th>Segments</th><th>Description</th></tr>
<tr><td>Fernbank Creek</td><td>1</td><td>Fernbank Creek is a tributary to the Hastings River and is located at the end of the access road in Segment 1 and 700 m north of the proposed WWTP facility. This creek flows to the north towards Hastings River. Fernbank Creek and associated tributaries and wetlands intersects Segment 1.</td></tr>
<tr><td>Partridge Creek</td><td>1, 2, 3, and 4</td><td>Partridge Creek is a tributary to the Hastings River. Partridge Creek and its tributaries intersects several sections of Segment 1, 2, 3 and 4 at different locations as detailed in Section 3.1. The wetland associated with Partridge Creek located east of the proposed WWTP also intersects portions of Segments 2, 3 and 4. Partridge Creek flows to the north towards Hastings River.</td></tr>
<tr><td>Hastings River</td><td>1 - 7</td><td>Hastings River is located north to north-east of the Thrumster Wastewater Scheme with the nearest point located 700 m north of the intersection between Segments 3, 4 and 5 at Tuffins Lane. It flows to the east and drains to Tasman Sea. Several tributaries to the Hastings River intersect Segments 3,4, 5 and 7.</td></tr>
<tr><td>Kooloonbung Creek</td><td>7</td><td>The return effluent of the Thrumster WSS drains at the Kooloonbung Creek located at the end of Segment 7 in the existing WWTP aeration ponds.</td></tr>
</table></td></tr>
<tr><td>Geology and soils</td><td>Reference to the NSW Surface Geology Maps (MinView, NSW Statewide Seamless Geology) indicates that the subsurface geology along the proposed Thrumster WWTP and pipeline routes varies between the following:
– Alluvial backswamp deposits (Q_ab) - organic-rich mud, peat, silt, clay formed during the quaternary (2.58 - 0.0 million years ago (Ma)) period.</td></tr>
</table>

Setting	Site conditions

– Alluvial fan deposits (Q_avf) - fluvially-deposited quartz-lithic sand, silt, gravel, clay formed during the quaternary (2.58 - 0.0 Ma).
– Alluvial floodplain deposits (QH_af) - silt, very fine- to medium-grained lithic to quartz-rich sand, clay formed during the holocene (0.0117 - 0.0 Ma) period.
– Alluvial levee/overbank deposits (Q_al) - fluvially deposited fine- to medium-grained lithic to quartz-rich sand, silt, clay formed during the quaternary (2.58 - 0.0 Ma) period.
– Coastal deposits - backbarrier flat (Qp_bf) - fine- to medium-grained quartz-lithic sand with carbonate and humic components (marine-deposited), indurated sand, silt, clay, gravel, organic mud, peat formed during the Holocene (2.58 - 0.0 Ma).
– Coastal deposits - beach-ridge (Qp_brs) - fine- to medium-grained quartz-lithic-carbonate (marine-deposited) sand, organic-rich mud, peat formed during the Holocene (2.58 - 0.0 Ma) period.
– Coastal deposits – dune facies (QP_bd) - marine-deposited and aeolian-reworked coastal sand dunes; partially consolidated formed during the Holocene (2.58 - 0.0 Ma) period.
– Estuarine tidal-delta flat (QH_et) - fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell material, polymictic gravel formed during the Holocene (0.0117 - 0.0 Ma).
– Karikeree Metadolerite (P_k) - Massive cleaved metadolerite. Lopingian (259.1 - 251.902 Ma)
– Thrumster Slate (P_t) - slate, metasandstone and metagranule conglomerate formed during the Permian (298.9 - 251.902 Ma) period.
– Touchwood Formation (Duno) - siltstone, sandstone, paraconglomerate, basaltic breccia, keratophyric andesite formed during the late Devonian (382.7 - 358.9 Ma) period.
– Watonga Formation (Ouuw) - slate, chert, minor slaty sandstone, rare metabasalt formed during the Late Ordovician (465.0 - 449.7 Ma) period.

The different geological units identified within each segment are summarised below.

Segment	Geology
1	Coastal deposits – dune facies (QP_bd), Alluvial fan deposits (Q_avf), Coastal deposits – dune facies (QP_bd), Thrumster Slate (P_t), Coastal deposits – dune facies (QP_bd), Alluvial floodplain deposits (QH_af)
2	Coastal deposits – dune facies (QP_bd), Alluvial backswamp deposits (Q_ab), Alluvial floodplain deposits (QH_af), Thrumster Slate (P_t), Karikeree Metadolerite (P_k)
3	Coastal deposits – dune facies (QP_bd), Alluvial floodplain deposits (QH_af), Alluvial backswamp deposits (Q_ab), Alluvial levee/overbank deposits (Q_al)
4	Coastal deposits – dune facies (QP_bd), Alluvial floodplain deposits (QH_af), Alluvial backswamp deposits (Q_ab), Thrumster Slate (P_t), Coastal deposits - beach-ridge (Qp_brs)
5	Coastal deposits - beach-ridge (Qp_brs), Coastal deposits – dune facies (QP_bd), Coastal deposits - backbarrier flat (Qp_bf), Estuarine tidal-delta flat (QH_et), Touchwood Formation (Duno), Karikeree Metadolerite (P_k)
6	Touchwood Formation (Duno), Karikeree Metadolerite (P_k), Coastal deposits - backbarrier flat (Qp_bf), Coastal deposits – dune facies (QP_bd), Estuarine tidal-delta flat (QH_et), Alluvial fan deposits (Q_avf)
7	Touchwood Formation (Duno), Karikeree Metadolerite (P_k), Alluvial fan deposits (Q_avf), Watonga Formation (Ouuw), Coastal deposits - backbarrier flat (Qp_bf), Estuarine tidal-delta flat (QH_et)

A summary of the soil units identified within each segment and surrounding areas based on the Australian Soil Classification (ASC) and Atlas of Australian Soils is provided below.

Segment	ASC Soil Type
1	Podosols (PO), Hydrosols (HY), Ferrosols (FE)
2	Podosols (PO), Hydrosols (HY), Kurosols (natric) (KUn), Ferrosols (FE)
3	Podosols (PO), Hydrosols (HY)
4	Podosols (PO), Hydrosols (HY), Kurosols (KU), Kandosols (KA)
5	Podosols (PO), Kandosols (KA), Ferrosols (FE)
6	Podosols (PO), Kandosols (KA), Ferrosols (FE), Kurosols (natric) (KUn)

<table>
<tr><th>Setting</th><th colspan="2">Site conditions</th></tr>
<tr><td></td><td>7</td><td>Ferrosols (FE), Kurosols (natric) (KUn)</td></tr>
<tr><td>Acid sulfate soils</td><td colspan="2">A search of the NSW Planning Industry and Environment eSpade site for ASS potential indicated that portions of the project are classified as H1, high probability of ASS <1m below ground surface and L2, low probability of ASS between 1-3 below ground surface. The ASS in the area was a product of artificial drainage works in Partridge Creek between 1890 to 1989 which resulted to an enhanced oxidation of ASS in the area. The ASS potential for each segment is presented on Figure A-1, Appendix A.
<table>
<tr><th>Segment</th><th>ASS Probability of Occurrence</th></tr>
<tr><td>1</td><td>Majority of the WWTP and its compound is located in an area with low probability of ASS occurrence (L2(p)) within 1-3 m below ground surface while the access road located north of the WWTP, and portions of the emergency discharge line are located in an area with high probability of ASS occurrence (H1) <1 m below ground surface.</td></tr>
<tr><td>2</td><td>Approximately 1.2 km of Segment 2 (from the WWTP) is located in a low (L2(p)) probability 1-3 m below ground surface and high (H1) probability of ASS occurrence <1 m below ground surface.</td></tr>
<tr><td>3</td><td>This segment is located in an area with high probability of ASS occurrence (H1) <1 m below ground surface.</td></tr>
<tr><td>4</td><td>The first 0.6 km length of this segment (from the WWTP) is located in areas of both low (L2(p)) from 1-3 m below ground surface and high probability of ASS occurrence <1 m below ground surface (H1), and the last 0.2 km of the segment (towards the point of intersection with Segments 3 and 5) is located in an area with high probability ASS occurrence <1 m below ground surface (H1). The rest of the segment is located in an area with no known occurrence of ASS.</td></tr>
<tr><td>5</td><td>The first 0.2 km of the segment (from the point of intersection with Segments 3 and 4) is located in area with high probability of ASS occurrence <1 m below ground surface (H1), while the last 0.7 km of this segment (towards Hastings River Dr) is located in an area with low probability of ASS occurrence from 1-3 m below ground surface (L2). The rest of the segment is located in an area with no known occurrence of ASS.</td></tr>
<tr><td>6</td><td>The first 0.6 km of this segment (from the point of intersection with Segments 5) is located in an area with no known ASS occurrence. The rest of the area were not classified.</td></tr>
<tr><td>7</td><td>South of the last 0.4 km of this segment is an area with low probability of ASS occurrence from 1-3 m below ground surface (L2(p)).</td></tr>
</table></td></tr>
<tr><td>Naturally occurring asbestos</td><td colspan="2">An examination of the online NSW NOA map shows that that there is an area of low asbestos potential located in portions of Segments 2, 6 and 7 as presented in Figure A-2, Appendix A (Naturally Occurring Asbestos in NSW (arcgis.com)).</td></tr>
<tr><td>Hydrogeology and groundwater bore search</td><td colspan="2">An examination of the online WaterNSW online database identified 42 registered groundwater bores within 500 m of the segments (https://realtimedata.waternsw.com.au/) which are summarised below.
Review of the Australian Groundwater Explorer (BoM, 2018) showed that out of the identified 42 bores, only six were listed as functional, two were removed and the rest had unknown status. For the functional wells, water uses were recorded as domestic, dewatering supplies and farming. Bore depths are ranged from 3.2 metres below ground level (mbgl) to 50 mbgl. Groundwater in the vicinity of the segments would be expected to vary between 1.3 mbgl and 30 mbgl.
Based on GHD’s understanding of the environmental setting of the site, regional groundwater is expected to flow to the east towards Tasman Sea.
Based on the bore usage information reviewed as part of the groundwater bore search, it is possible that groundwater within the area could be used for either domestic, commercial, industrial, recreational or irrigation purposes.
<table>
<tr><th>Bore ID</th><th>Segment</th><th>Salinity description</th><th>Standing Water level (mbgl)</th><th>Final depth (mbgl)</th><th>Intended Purpose</th><th>Status</th></tr>
<tr><td>GW072717</td><td>1</td><td></td><td>9.0</td><td>31.0</td><td>Domestic, stock</td><td>Unknown</td></tr>
<tr><td>GW301108</td><td>1</td><td></td><td>10.0</td><td>29.0</td><td>Domestic</td><td>Unknown</td></tr>
</table></td></tr>
</table>

Setting	Site conditions						
	GW068734	1		-	46.0	Domestic, stock	Unknown
	GW300990	2	Poor	30.0	30.0	Domestic	Unknown
	GW070478	2		6.0	18.0	Domestic	Unknown
	GW303087	2			40.5	Domestic	Unknown
	GW307179	5		1.5	6.5	Dewatering	Functioning
	GW062940	5			3.6	Farming	Functioning
	GW062939	5			6.0	Farming	Functioning
	GW062938	5			3.6	Farming	Functioning
	GW062937	5			3.6	Farming	Functioning
	GW305551	5			6.0	Domestic	Unknown
	GW306718	5			7.0	Domestic	Unknown
	GW305593	5		5.5	9.0	Domestic	Unknown
	GW305584	5		5.0	8.0	Domestic	Unknown
	GW307506	5		2.0	7.20	Domestic	Functioning
	GW069071	5		1.3	27.0	Domestic, stock	Unknown
	GW300032	5			10.0	Commercial and industrial	Unknown
	GW065479	5	Good	2.7	39.6	Industrial	Unknown
	GW303163	5			16.0	Domestic	Unknown
	GW305580	5			12.0	Domestic	Unknown
	GW305712	5			7.0	Domestic	Unknown
	GW300628	5		3.0	21.0	Domestic	Unknown
	GW303105	5			15.0	Domestic	Unknown
	GW065970	6		8.1	36.0	Recreation	Unknown
	GW305777	6		2.0	24.0	Domestic	Unknown
	GW303730	6		10.0	40.5	Domestic	Unknown
	GW070986	6		27.0	45.0	Domestic	Unknown
	GW034732	6			3.2	Domestic, stock	Unknown
	GW073051	6		20.0	17.0	Domestic	Unknown
	GW303133	6,7			39.0	Domestic	Removed
	GW302339	6,7			41.0	Commercial	Removed
	GW073176	6,7		4.0	10.60	Domestic	Unknown
	GW304587	6,7	Other		9.10	Domestic	Unknown
	GW303773	6,7		20.0	28.2	Domestic	Unknown
	GW070994	7	Good	2.0	18.0	Domestic	Unknown
	GW302654	7				Irrigation	Unknown
	GW300433	7		1.5	16.0	Industrial	Unknown
	GW302494	7	Good	5.0	14.6	Commercial	Unknown

Setting	Site conditions						
	GW300165	7		12.3	50.0	Domestic, stock	Unknown
	GW073614	7	Very good	5.0	15.0	Stock	Unknown
	GW305726	7			15.0	Domestic	Unknown

4. Desktop investigation

The following sections provide an overview of the desktop information as obtained from publicly available information and information provided by Council.

4.1 Aerial photograph review

A selection of historical aerial photographs were obtained from NSW Land and Property Information (a division of the Department of Finance, Services and Innovation) for years 1956, 1968, 1979, 1989 and 1991. NearMap was also reviewed for years 2010, 2019 and 2023. These were examined to assess past activities and land uses at the project which includes the WWTP including the recycled water plant. The historical aerial photos are provided in Appendix D. Due to the size and complexity of the project, the aerial photography investigation was undertaken as per the alignment segments outlined in Figure 1.1. Results of the aerial photograph review are summarised in Table 4.1.

Table 4.1 Review of historical aerial photographs

Segment	Year of photograph and type	Observations
1,3 and 4	1956 (Black and white)	The area wherein the new WWTP and recycled water plant is proposed to be located is vacant and undeveloped. Dense vegetation is noted adjacent west to south of the proposed WWTP location and areas where Segments 3 and 4 passes through. Areas adjacent north and east of the WWTP location appears to be wet. Partridge Creek and its tributaries located within 500 m southeast to north from the proposed WWTP are already visible. Fernbank Creek located west and the Hastings River located north of the proposed WWTP are also visible. Fernbank Creek Road located north and west of the Segments is visible but appears to be unsealed while Tuffins Lane is not yet visible. The rest of the surrounding area appears to be undeveloped except for the Runway east of the Segments. Some infrastructure located 140 m west of the access road adjacent to Fernbank Creek Road is also visible.
	1968 (Black and white)	No significant changes are visible in Segments 1, 3 and 4, however, it is noted that Tuffins Lane where Segments 3 and 4 intersects is now visible. An access road from Fernbank Creek Road towards the proposed WWTP location is also visible. More infrastructure (albeit low in density) are also visible west of the access road.
	1979 (Black and white)	A residential area in the western portion of Segment 1 is now visible. A patch of land within the densely vegetated area located west of the proposed WWTP is also visible. Some structures and a water pond are visible further to the west. More developments are visible at the airport east of the segments.
	1989 (Black and white)	There appears to be no significant changes in Segments 1, 3 and 4, with more low density structures visible north and west of the segments.
	1991 (Colour)	There appears to be no significant changes in the segments and surrounding areas.
	2010 (Colour)	The access road from Fernbank Creek Road now extends within the proposed WWTP location. Several access roads are also visible east of Patridge Creek towards the airport. A portion of land adjacent the northern section of the airport had been cleared.
	2019 (Colour)	There appears to be no significant changes from the previous aerials.
	2023 (Colour)	Several access roads are visible within the proposed WWTP locations. No significant changes were visible to the rest of the segments and the surrounding areas.
2	1956 (Black and white)	Majority of the area surrounding Segment 2 is densely vegetated. Tributaries of Fernbank Creek located north-west of Segment 2 are visible. John Oxley Drive is located at the southern end of Segment 2 and Fernbank Creek Road West are already visible.

Segment	Year of photograph and type	Observations
	1968 (Black and white)	There has been some thinning out /clearing of vegetation in some areas in the southern portion of Segment 2. The Pacific Highway located west of Segment 2 and an unsealed access road from the Pacific Highway located in the southern portion of Segment 2 are now visible.
	1979 (Black and white)	There has been further thinning out/clearing in the vacant lot located in the south-east portion of Segment 2. Thrumster Street is now more visible. The electrical substation located approximately 314 m west of Segment 2 adjacent Thrumster Street is now visible. A water pond located 80 m east of Segment 2 (from the corner of Thrumster Street) is also visible. More structures which are potentially residential properties can be observed along John Oxley Drive.
	1989 (Black and white)	The lot located 500 m west of Segment 2 adjacent to the electric substation has now been developed with several water ponds visible. An access road connecting Fernbank Creek Road and Thrumster Street is now visible.
	1991 (Colour)	An above ground storage tank and an access road located 6.6 km along Segment 2 are now visible. No other significant changes were noted. Some vegetation clearance/thinning has occurred in the vacant lot located in southern portion of the segment.
	2010 (Colour)	Several unsealed access roads are now visible in the cleared lot located in the southern portion of Segment 2. Approximately 920 m of this access road will be used as part of Segment 2. There is an increase in residential/commercial areas on both sides of the southern portion of the segment and along John Oxley Drive. St. Joseph's Regional College located 670 m west of Segment 2 is also now visible.
	2019 (Colour)	No significant changes along Segment 2 are observed. More residential areas have been built further to the west of Segment 2.
	2023 (Colour)	The Glenfern – Over 50's Lifestyle Community located approximately 150 west of Segment 2 is now visible. No significant changes to the rest of the segment and surrounding area are visible.
5	1956 (Black and white)	The majority of the area surrounding Segment 5 is undeveloped. Most of Boundary St is already visible. The airport Runway is clearly visible with an access road from the Runway towards Kemp Street is visible. The Binnacle and Kemp Street where approximately 980 m of Segment 5 is located are already visible. Scattered vegetation is visible along the area surrounding the Binnacle and Kemp Street to its west. Hastings River Drive where the last 550 m portion of Segment 5 is located is also visible with majority of the segment cleared on both sides except for the lot located in the intersection of Kemp Street and Hastings River Drive which remains vegetated. Some structures (which could potentially be either residential or commercial) are also visible along the Hastings River Drive. The proposed Thrumster compound at the end of Segment 5 is still vacant. Some residential areas within 100 m south-east of this compound are already visible.
	1968 (Black and white)	Tuffins Lane where approximately 660 m of Segment 5 is located is now visible. This is intersected by Boundary Road at 660 m. The development at the Port Macquarie Airport has expanded adjacent to the south of Tuffins Lane. The majority of the area surrounding Segment 5 along Kemp Street and The Binnacle remains undeveloped. However, the area east of Kemp Street has been cleared, and several streets and low density housing are now visible. More structures are now visible north of Hastings River Drive but the area wherein the compound is proposed appears to still be vacant.
	1979 (Black and white)	More developments are visible within the Port Macquarie Airport. The lot located along the 870 m of Segment 5 has now been cleared with a small structure built in the corner of the lot. More residential houses are visible east of Kemp Street while more commercial structures are now visible along Hastings River Drive including the proposed compound at the end of Segment 5. Some developments north of The Binnacle have been cleared with some structures built.
	1989 (Black and white)	Some developments north of The Binnacle have been cleared with some structures and water ponds visible while the lot adjacent to the south is still undeveloped. There are no significant changes in the rest of the areas along and surrounding Segment 5.

Segment	Year of photograph and type	Observations
	1991 (Colour)	There are no significant changes in the rest of the areas along and surrounding Segment 5.
	2010 (Colour)	There appears to be more development within the Port Macquarie Airport. The Newman Senior Technical College in the corner of Tuffins Lane and Boundary Road is now visible. The structure in the lot along 870 m of Segment 5 first noted in the 1979 aerial is now demolished. More residential areas on both sides of The Binnacle area now visible.
	2019 (Colour)	The lot along 870 m of Segment 5 is now being developed. No significant changes are noted in the rest of Segment 5.
	2023 (Colour)	Some soil stockpiles are visible in the lot located at 870 m of Segment 5. No significant changes are noted in the rest of Segment 5.
6 and 7	1956 (Black and white)	John Oxley Drive where portions of Segment 7 are located and the Fernhill Road and Lake Road where portions of Segment 6 are situated are all now visible. The majority of the area in the vicinity of Segments 6 and 7 are undeveloped with scattered structure. Some areas surrounding Fernhill Road are cleared with most areas north of Lake Road also cleared. The racecourse and access road leading to the Hastings Valley Hunting Club are also now visible.
	1968 (Black and white)	Development on the racecourse is visible with the shape now similar to its current layout. No significant changes to the rest of the areas are visible.
	1979 (Black and white)	More developments are visible along Segments 6 and 7 and their surrounding areas, with residential and commercial areas visible. Acacia Avenue wherein portions of Segment 6 is located is visible but does not appear to have been completely developed yet. Several aeration ponds which are part of the existing Port Macquarie WWTP are now visible at the end of Segment 7.
	1989 (Black and white)	More developments are visible along Segments 6 and 7 and their surrounding areas, with residential and commercial areas visible. Acacia Road is now fully developed.
	1991 (Colour)	There appears to be no significant changes from the previous aerial.
	2010 (Colour)	Oxley Highway is now visible but is still being constructed and unsealed. High density residential areas are visible south of the racecourse. The Port Macquarie Base Hospital is also now visible. There are also more residential and commercial/industrial developments across the surrounding areas along Segments 6 and 7.
	2019 (Colour)	Construction of Oxley Highway is now complete. Overall, more residential and commercial/industrial developments across the surrounding areas along Segments 6 and 7 are noted compared to the previous aerial.
	2023 (Colour)	There appears to be no significant changes from the previous aerial.

Based on the review of historical aerial photographs, the area where the WWTP is located (Segments 1, 3 and 4 and portions of Segment 2) has always been part of the wetlands of Partridge Creek and Fernbank Creek with very little development. The Port Macquarie Airport was operational as early as the 1950's based on the presence of the runway in the early aerials. Other areas assessed as part of this PSI were rural properties or densely vegetated until residential and commercial/industrial development began in the 1960s. Since then, continued development has occurred with some larger agricultural and rural properties now converted to high-density residential and commercial/industrial land use. The immediate area surrounding portions of Segment 2 and Segment 5, 6 and 7 predominantly consists of residential and commercial/industrial land use, with some scattered rural and agricultural properties.

4.2 Previous investigation reports

A number of previous investigations have been conducted within and surrounding the area. The following reports were reviewed as part of this contamination assessment:

- Aaso, T., Rogers M. and Johnston S., *Remediation of Partridge Creek Acid Sulfate Soil Hot Spot*, 2003
- CH2M 2005, *Thrumster Wastewater Scheme Environmental Impact Statement*, Port Macquarie Hastings, September 2005 Document Reference 313835
- Coffey 2007, *Patridge Creek Soil Survey Land Assessment*, Port Macquarie Hastings Council, 30 October 2007, Document Reference GEOTPMAQ00156AA-AB
- Coffey 2008a, *Thrumster Sewer Pipeline Geotechnical Investigation,* Port Macquarie Hastings Council, April 2008, Document Reference GEOTPMAQ00150AA-AB
- Coffey 2008b, *Sewer Pump Station #7, Hastings River Drive, Port Macquarie Geotechnical Investigation Final Report*, Port Macquarie Hastings Council, August 2008, Document Reference GEOTPMAQ00150AB-AE
- Douglas CMG 2017a, *Report on Geotechnical Investigation, Proposed Reclaimed Water Interim Supply Main, Barton Cresent, Port Macquarie*, Port Macquarie Hastings Council, January 2017, Project 89650.00
- Douglas CMG 2017b, *Report on Geotechnical Investigation, Proposed Reclaimed Water Interim Supply Main, Stages 3 to 8, Oxley Highway, Port Macquarie*, Port Macquarie Hastings Council, June 2017, Project 89650.01
- GHD 2023, *Thrumster Wastewater Supply Scheme - Groundwater Monitoring Bore Installation Report (Letter)*, Port Macquarie, NSW, 2444.
- PMHC, Acid Sulfate Soil Management Plan for Pipe Infrastructure Installations
- RGS 2024, *Proposed Thrumster Wastewater Treatment Plant – 433 Fernbank Creek Road, Thrumster, Geotechnical Assessment,* RGS21503.1 – AC, 24 May 2024

Table 4.2 Summary of Previous Investigations

Segment	
1, 2, 3 and 4	**Aaso, T., Rogers M. and Johnston S. (2003), Remediation of Partridge Creek Acid Sulfate Soil Hot Spot** Due to the artificial drainage works constructed in Partidge Creek between 1890 and 1989, the natural hydrology of the freshwater backswamp have been dramatically altered which resulted to enhanced oxidation of ASS and is expected to -0.7 mAHD. The Partridge Creek drainage network chronically discharges extremely acidic water that are rich in iron (Fe) and aluminium (Al) to the Hastings River (pH <3, Fe >25 mg/L, Al >25 mg/L). There is approximately 1.1 to 1.5 million m^3 of ASS within the Partridge Creek hotspot. A remediation strategy to reduce acid flux from Partridge Creek to the Hastings River estuary was implemented by containing the acidic groundwater and restoring the former hydrology of the freshwater backswamp. The containment of acidic waters and ability to regulate water levels were achieved by: – Installing of a fully automated hinged weir gate within the main drainage channel of Partridge Creek – Infilling low points between natural distributary levees – Infilling strategic sessions of the drainage network within the upper catchment Water levels within the confined wetland were to be managed to a height of 0.9 mAHD for 3 years and can be increased to a maximum 1.1mAHD depending on the effects of the inundation to threatened species in the area. A Hydro Active Lime Dosing System was installed onsite to enable strategic lime dosing to treat acidic water prior to discharge to and during discharge events.
1, 2, 3 and 4	**CH2M (2005) Thrumster Wastewater Scheme Environmental Impact Statement** An EIS was prepared for the Port Macquarie Hastings Council to assess the environmental impacts associated with the construction and operation of the proposed Thrumster Wastewater Scheme. The EIS was limited to the Sewage Treatment Plant location and did not include the associated reticulation system.

Segment	
	The Thrumster land includes cleared lands that were primarily used for agricultural purposes, remnant forest or wetlands. Based on its land history and absence of any land development at the site, contamination in the area was not expected. Most of the Thrumster Land contains ASS. The area which was previously a wetland has since been drained which resulted in the exposure of the ASS. The soils within the study area are classified as Class 2 Acid Sulfate Soils.
1, 2, 3 and 4	**Coffey (2007), Partridge Creek Soil Survey Land Assessment** The site was a backswamp of Hastings River and was a wetland vegetated by a mix of associated vegetation, swamp forest and sedgeland. During the investigation, minor areas of low grade pasture were observed which were remnants from historical grazing In the wetlands. Former roads that were previously constructed within the wetlands were removed and resulted in further excavation of the natural soils of the wetland. A geotechnical land assessment was carried out to ascertain whether the removal of the access tracks resulted in the removal of the natural soils. The scope of work included: – Advancement of 13 shallow test pits to depths ranging from 0.25 mbgl to 0.45 mbgl. – Observation and mapping of relevant site features. – Collating and reporting of the results <u>Surface conditions</u> – The site contains extensive swamp areas of low relief (0 - 3°) and an elevation <2 mAHD. – The site consists of backswamps and supratidal flats and is surrounded by gently to moderately undulating hills to the south and west. – Drainage occurs by filtration and by overland flow into series of broad, low drainage gullies or depressions. <u>Subsurface conditions</u> – Based on 1:100,000 Kempsey/Korogoro Point Soil Landscape Sheet, the site consists of extensive Holocene coastal estuarine swamps overlain by thin alluvial sediments. – 5,000 Port Macquarie Acid Sulfate Soils (ASS) Risk Map, the Partridge Creek wetlands are an estuarine back swamp with a high risk of ASS within 1mbgl. Some areas that are located in the aeolian Pleistocene sand plain have a low risk of ASS between 1 m and 3 mbgl. – Subsurface soils encountered from the test pits included: • Fill material associated with the former track composed of clay at depths ranging from 0.0 m to 0.22 m depth from surface. • Topsoil consisting of clayey silt or silty sand to depths ranging from 0.0 m to 0.32 m depth from surface. • Alluvial soils composed of silty sandy clay, silty clay and organic silty clay at depths ranging from 0.02 mbgl to 0.45 mbgl. <u>Groundwater</u> – At the time of fieldwork, water levels were at or near the surface across the site ranging up to approximately 0.35 mbgl. – The depth to the water table is typically approximately 20 cm below the soil surface. • Based on the results, the rehabilitation of Tracks WL4a and WL3 resulted in a minor loss of topsoil and humus from the upper profile. In Road WL2a some areas of visible over excavation, areas with road fill visible remaining and areas with significant coverage of geofabric remaining since removal of the road.
1, 2, 3 and 4	**Coffey (2008a), Thrumster Sewer Pipeline Geotechnical Investigation** A geotechnical investigation was carried out for the proposed Thrumster Sewer Pipeline to assist in the geotechnical design. The proposed pipeline commenced near the Port Macquarie Airport and to the Partridge Creek wetland and the proposed Sewerage Treatment Plant (STP) until the proposed pipeline south of the STP location. The scope of work included: – Advancement of 10 boreholes for standard penetration test (SPT) testing and soil sampling. – Laboratory testing for particle size distribution, Atterberg limits and linear shrinkage testing and point load testing of rock. – Soil aggressivity testing (sulfate, chloride and pH). – Potential Acid Sulfate Soil testing. – Collating and reporting of the results.

Segment	
	Surface conditions – The site contains extensive swamp areas of low relief (0 - 3°) and an elevation <2 mAHD. – It consists of backswamps and supratidal flats and is surrounded by gently to moderately undulating hills to the south and west. – Drainage occurs by filtration and by overland flow into series of broad, low drainage gullies or depressions. – Minor water flow towards drainage depressions. Subsurface conditions – Based on 1:25,000 Port Macquarie Acid Sulfate Soils (ASS) Risk Map, the Partridge Creek wetlands are an estuarine back swamp with a high risk of ASS within 1mbgl. Some areas that are located in the aeolian Pleistocene sand plain have a low risk of ASS between 1 m and 3 mbgl. – Subsurface soils encountered from the test pits included: • A near-surface layer of loose to medium dense Aeolian SAND to depths of 4.3 m. • An indurated SAND (coffee rock) horizon was present from 0.3 m to 7.75 m depth from surface. • An upper layer of loose to medium dense Marine SAND, to depths ranging from 0.5 m to 8.5 m, generally below the water table and with Potential ASS sometimes present. • A lower layer of soft to firm Marine CLAY from 0.8 m to 17.5 m from surface, generally below the water table and with Potential ASS present in some locations. • An underlying thick residual CLAY profile of medium to high plasticity Clay that graded gradually to extremely weathered and then highly weathered Sandstone, Siltstone or Slate. Groundwater – Groundwater was encountered in all testpits at depths ranging from 0.8 mbgl to 2.25 mbgl. Acid Sulfate Soils – Six out of the eight samples tested from four boreholes recorded S_{CR} Results exceeding relevant ASSMAC Action Criteria Value at depths ranging from 2.5 mbgl to 10.2 mbgl. The Titratable Actual Acidity values were also elevated from samples collected at depths ranging from 1.0 mbgl to 5.65 mbgl which may indicate presence of actual ASS in this area. – These boreholes were located on the margins of the main Partridge Creek backswamp. The actual ASS areas are likely to be closer to the surface in the centre of the backswamp.
5	**Coffey (2008b), Sewer Pump Station #7, Hastings River Drive, Port Macquarie Geotechnical Investigation Final Report** A geotechnical investigation was carried out for the proposed Sewer Pump Station #7, Hastings River Drive, Port Macquarie to assist in the geotechnical design. The scope of work included: – Allowable bearing pressures for the proposed foundations supported on natural ground or controlled fill. – Potential for consolidation settlement and recommendations if necessary. – Excavation conditions for the foundations, wet wells and pipelines within the site boundaries and possible rock excavation techniques. – Likely extent of groundwater and associated dewatering requirements. – Allowable passive pressure for rising main thrust blocks from the pumping station. – Site Classification as per AS 2870. – Recommendations as to site preparation to support concentrated building loads, floor slabs and/or traffic pavements. – Preliminary assessment on the properties and distribution of ASS. Site History At the time of the investigation, the existing brick building at the northern portion of the site was being used as a temporary depot by PMHC. A high voltage power transformer is also located adjacent to the existing wet well pump station. Ground Conditions The investigation revealed Sand and Clay fill of variable composition and compaction overlying Topsoil, aeolian Sands and marine deposits of medium dense to dense Sand and firm to very Clay overlying extremely weathered to highly weathered Sandstone.

Segment	
	Groundwater – Groundwater was encountered between 1.05 mbgl to 2.85 mbgl. Acid Sulfate Soils – Nine samples were collected and analysed for ASS field screening. The pH of the soils collected ranged from 6.80 to 7.76. After oxidation, the pH dropped ranged from 0.4 to 3.7, with two samples resulting to a pH drop greater than 3 which is indicative of potential ASS. – However, further analysis showed that the Chromium Reducible Sulfur (S_{CR}) were all below relevant ASSMAC Action Criteria Value on all four samples tested. The investigation did not identify any acid sulfate material present on the Site.
6	**Douglas CMG (2017a), Report on Geotechnical Investigation, Proposed Reclaimed Water Interim Supply Main, Barton Cresent, Port Macquarie** The investigation included the proposed locations for the new reclaimed water main pipeline. *(This study included portions of Segment 6 along Borton Crescent.)* The scope of work included: – Advancement of 7 boreholes along the proposed new reclaimed water main pipeline to maximum depth of 4.45 mbgl for SPT and pocket penetrometer test at selected depths. Four boreholes (located in the current along Barton Crescent) were considered relevant to the current scheme. – ASS screening test for 21 selected soil samples. – Detailed ASS testing for 2 soil samples. Ground Conditions – Fill materials have been observed between 0 to 1.45 mbgl, and the rest of the subsurface materials consisted of clay, silty clay, sandy clay and sand to a maximum depth of 4.45 mbgl. – Groundwater was observed in the majority of the soil bores during drilling with groundwater levels along Barton Cresent recorded between 1.0 mbgl to 2.1 mbgl. Acid Sulfate Soils – Twenty-one samples were collected and analysed for ASS field screening. The pH of the soils collected ranged from 5.2 to 6.7. After oxidation, the pH dropped ranged from 0.0 to 1.3, with two sample locations resulting to a pH drop >1 unit or more which is indicative of potential ASS. – However, further analysis showed that the S_{CR} were all below relevant ASSMAC Action Criteria Value on all four samples tested. – The investigation did not identify any acid sulfate material present on the Site.
2, 6 and 7	**Douglas CMG (2017b), Report on Geotechnical Investigation, Proposed Reclaimed Water Interim Supply Main, Stages 3 to 8, Oxley Highway, Port Macquarie** The investigation included the proposed locations for the new reclaimed water main pipeline. *(This study included the intersection of Segment 2 to Oxley Highway and portions of Segment 6 and 7.)* The scope of work included: – Advancement of 7 boreholes along the proposed reclaimed water interim supply main at Barton Crecent, Port Macquarie. trenchless crossings to a maximum depth of 3.1mbgl for SPT while pocket penetrometer test were undertaken at selected depths. The following boreholes advanced in this investigation that maybe relevant to the current WWTP mains include: • Stage 3: 5 boreholes (located in current Segment 7) • Stage 4: 4 boreholes (located in current Segment 7) • Stage 7: 1 borehole (located approximately 180m southeast of the intersection of Segment 2 and Oxley Highway) Ground Conditions – Fill materials have been observed between 0 to 1.5 mbgl, and the rest of the subsurface materials consisted of clay, silty clay, sandy clay, sandy silt, sand and weathered bedrock. – No groundwater was observed in the majority of the tested locations except for one point located near the roundabout between John Oxley Dr and Oxley Highway located approximately 1 km north-east of Segment 7.

Segment	
1, 2, 3 and 4	**GHD (2023), Thrumster Wastewater Supply Scheme – Groundwater Monitoring Bore Installation Report, Port Macquarie** Five groundwater monitoring bores (MW1 to MW5) were installed around the proposed location of the WWTP which will be used by Council to collect groundwater samples and establish seasonal background groundwater conditions in the area prior to the WWTP construction. Groundwater was first encountered between 1.04 mbgl to 2.01 mbgl in the clay layer in four out of the five monitoring wells. One well (MW3) located approximately 230 m from the western boundary of the proposed WWTP did not encounter groundwater during drilling up to the maximum depth of 12 mbgl but was measured at 2.77 mbgl in the clay layer during well development. Clay/sandy clay was observed during drilling up to 0.5 mbgl, underlain by high plasticity clay to a maximum depth of 3.5 mbgl for wells (MW1 and MW2) advanced north of the proposed WWTP location. The lithology at MW3 located approximately 230 m from the western boundary of the proposed WWTP consisted of a sand to 0.5 mbgl, underlain by clayey sand/sandy clay to 3 mbgl, followed by clay to 4.5 mbgl, then highly weathered rock to 9 mbgl, then clay to the termination depth of 11.0 mbgl. The lithology at MW4 and MW5 located south of the WWTP location consisted of silt and clayey sand up to 0.5 mbgl, underlain by sand to a 2.0 mbgl, than sand with silt to maximum depths of 4.2 mbgl.
1, 2, 3 and 4	**RGS (2024), Proposed Thrumster Wastewater Treatment Plant – 433 Fernbank Creek Road, Thrumster, Geotechnical Assessment** A geotechnical assessment was carried out for the proposed Thrumster WWTP site, access road to the north of the proposed WWTP and the alternative access road to the west. The scope of work included: – Observation of site features and surrounding features relevant to the geotechnical conditions of the site. – Advancement of eight boreholes to depths between 3 m and 29.6 m. Two boreholes were extended using rock coring techniques to depths of between 14.55 m to 31.1 m. Standard SPT were undertaken at 1.5 m intervals to assist in the assessment of the materials within the soil profile. – Eight test pits were advanced to depths between 1.2 m to 1.5 m. – Installation of two groundwater monitoring wells to a depths of 3.0 m. – Analysis of selected soil samples for different analysis including ASS screening and chromium reducible sulfur analysis for potential ASS in a NATA accredited laboratory. <u>Site Description</u> The WWTP site comprised of cleared, unused farmland with a small single story residential dwelling and farm buildings in the northwestern corner of the proposed building area. A gravel access track runs north to south through the site. <u>Subsurface Conditions</u> The investigation identified the following subsurface conditions at each locations: – The subsurface conditions encountered at the WWTP locations included topsoil, marine sands, alluvial clays and residual clays. – The subsurface conditions encountered at the proposed access track to the north of the WWTP included fill gravel, fill clay, fill cobbles, topsoils, marine sands and alluvial clays. – The subsurface conditions encountered at the alternative access track to the west of the WWTP included fill gravel, fill clay, fill cobbles, topsoils, marine sands and alluvial clays. <u>Reuse of site won materials</u> The topsoils onsite were not found suitable for reuse as engineered fill but maybe reused for landscaping purposes. Excavated soils including fill gravel, fill clay, fill cobbles, marine sand, alluvial clay, residual clay and extremely weathered sandstone were found suitable for engineering fill provided that it is placed in accordance with the recommendations of the report. However, additional assessment and classification was recommended should any existing fill require removal offsite. <u>Groundwater</u> – Water inflow was encountered throughout the different strata commonly near the interface between the marine sands and the underlying alluvial sands/clays.

Segment	
	Acid Sulfate Soils – Four samples were collected and analysed for ASS field screening in two locations at depths between 1.0 to 1.45 m and 2.5 to 2.95 m. The reduced inorganic sulfate concentrations on all soil samples were below action criteria for fine and coarse materials indicating that the materials are not Potential ASS. The net acidity in one sample collected within the proposed WWTP location at depth of 2.5 m to 2.9 5m exceeded the adopted action criteria for net acidity (TAA). On the other hand. – Based on these results, an ASS Management Plan will be required if the alluvial sands below 2.5 m will be disturbed during the proposed works. An ASS Management Plan is also needed should there be a disturbance of more than 1,000 tonnes of alluvial clays in the proposed WWTP location. – Due to the presence of sulfudic materials in the marine sand, alluvial sand and alluvial clay soils, the materials cannot be removed from the site as Virgin Excavated Natural (VENM) soils as per the NSW Waste Classification Guidelines (NSW EPA 2014).
All segments	**Hastings Council, Acid Sulfate Management Plan for Pipe Infrastructure Installations** The plan was designed for the installation of Hasting's Council sewer and water infrastructure in accordance with the management guideline defined in the Acid Sulfate Manual (1998). It is applicable to works associated with the excavation of acid sulfate soils for the trenching of water and sewer mains. As per the plan, all materials located within mapped areas of ASS at the indicative depth is to be considered ASS materials. Handling and management of ASS – When ASS material can be temporarily stockpiled and buried within 24 hours, excavated ASS materials are to be separated from the overlying topsoil. Once trenching and lying of pipes are completed, ASS materials and the topsoil are to be returned to the ground in the same order it came out. When ASS material cannot be buried within 24 hours or there is surplus, the ASS material needs to be separated from the topsoil and temporarily stockpiles do treatment. Treatment will include application of lime at a standard rate of 100 kg of lime per cubic metre of soil. Treated ASS is considered clean fill and can be disposed accordingly.

4.3 NSW Environment Protection Authority

A search of the datasets maintained by NSW EPA including notices under the CLM Act and the POEO Act EPL Register was carried out. The search results are summarised in Table 4.3 below.

Table 4.3 NSW EPA dataset search

	Summary
List of NSW contaminated sites notified to EPA	A search of the EPA record of notices for the Port Macquarie-Hastings LGA did not reveal any documented contaminated sites to date.
Contaminated land record of notices	The search identified 11 sites within 3 km of the study area that have been notified to the NSW EPA as summarised below.

Organisation	Address	Type	Status	Distance from study area
Air BP Avgas Facility	Oliver Drive, Port Macquarie	Other Petroleum	Regulation under CLM Act not required	within 200 m S of Segment 5
Caltex Service Station	92 Hastings River Drive, Port Macquarie	Service Station	Regulation under CLM Act not required	160 m NW of Segment 5

	Summary				
	Former Mobil Service Station	Corner Oxley Highway and Major Innes Drive, Port Macquarie	Service Station	Regulation under CLM Act not required	20 m N E of Segment 6
	Coles Myer	43 John Oxley Drive, Port Macquarie	Service Station	Regulation under CLM Act not required	70 m E of Segment 6
	Former Mobil Depot	211 Lake Road, Port Macquarie	Other Petroleum	Regulation under CLM Act not required	270 S of Segment 7
	Caltex Service Station	12-14 Bolwarra Road, Port Macquarie	Service Station	Regulation under CLM Act not required	680 m S of Segment 7
	Port Macquarie Council Depot	Koala Street, Port Macquarie	Unclassified	Regulation under CLM Act not required	750 m SE of Segment 7
	Caltex Service Station	112-114 Gordon Street, Port Macquarie	Service Station	Regulation under CLM Act not required	1.4 km NE of Segment 7
	Shell Coles Express Port Macquarie Service Station	121 Gordon Street, Port Macquarie	Service Station	Regulation under CLM Act not required	1.4 km NE of Segment 7
	Car Park	28 Hayward Street, Port Macquarie	Other industry	Regulation under CLM Act not required	1.5 km NE of Segment 7
	Caltex Port Macquarie Service Station	29 Lord Street, Port Macquarie	Service Station	Regulation under CLM Act not required	2.3 km NE of Segment 7

POEO license register

A search of the register identified three premises with a current or previous POEO licence in a 3 km radius from the study area. These are summarised below:

Organisation / Location Name	Address	Activity	Distance and direction from closest water routes
Current Licenses			
Port Marina Pty Limited	18 PARK Street, Port Macquarie	Boat construction/maintenance (general)	900 m NE of Segment 5
Port Macquarie Wastewater Treatment Plant / Port Macquarie Hastings Council	John Fraser Place, Port Macquarie	Sewage treatment processing by small plants	500 m SE of Segment 7
Port Macquarie Hastings Council	Kingfisher Road, Port Macquarie	Waste Management Facility including recovery of general waste and waste storage	700 m E of Segment 6
Surrendered Licenses			
BIRDON SANDS PTY LTD	4 Glenewan Road, Port Macquarie, NSW 2444		2.5 km NW of Segment 1
Ferrovial Construction (Australia) Pty Ltd	Intersection of Pacific Highway and Sancrox Road, Port Macquarie	Land-based extractive activity (Expired) Crushing, grinding or separating	1.6 km W of Segment 2
B & M Crowe Pty Ltd	Kingfisher Road, Port Macquarie	Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Within 700 m E of Segment 6
Bridle Concrete Resources Pty Limited	Kingfisher Road, Port Macquarie	Non-thermal treatment of general waste	Within 700 m E of Segment 6
J.R. and E.G. Richards Pty Ltd	Kingfisher Road, Port Macquarie	Aqueous waste treatment plant including non-thermal treatment of hazardous and other waste and waste storage (e.g., hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Within 700 m E of Segment 6
Port Macquarie Hastings Council	Kingfisher Road, Port Macquarie	Solid Waste Landfilling Inert Waste Landfilling Waste disposal by application to land	700 m E of Segment 6
No longer enforced			
Boral Resources (Country) Pty Limited	4 Belah Road, Port Macquarie	Concrete works	800 m S of Segment 7
Hanson Construction Materials Pty Ltd	14 Blackbutt Road, Port Macquarie	Concrete works	730 m S of Segment 7
HCOA Operations (Australia) Pty	Lake Road, Port Macquarie	Hazardous, Industrial or Group A Waste Generation or Storage	Within 2 km (S to NE) of Segment 7

	Summary			
	Limited (Trading as Nowra Private Hospital)			
	Holcim (Australia) Pty Ltd	35 Acacia Ave, Port Macquarie	Concrete works	200 m S of Segment 7
	North Coast Area Health Service	Wrights Road Port Macquarie	Hazardous, Industrial or Group A Waste Generation or Storage	Within 500 m E of Segment 6
	Port Macquarie Hastings Council	Kingfisher Road, Port Macquarie	Hazardous, Industrial or Group A Waste Generation or Storage	700 m E of Segment 6

4.4 Other information

Other information resulting from searches of publicly available databases as available on public databases and the GIS WebMap is summarised in Table 4.4.

Table 4.4 Publicly available database search of landuses

<table>
<tr><th>Landuses</th><th>Details</th></tr>
<tr><td>Former Gas Works</td><td>Nil records</td></tr>
<tr><td>Waste Management Facilities</td><td>A search of the Waste Management Facilities Database (Department of Agriculture, Water and Environment (DAWE)) showed that there are currently four existing waste management facilities within the 3 km radius from the proposed WWTP, clear water reservoir and trunk main route locations as summarised below:
<table>
<tr><th>Organisation</th><th>Address</th><th>Type</th><th>Status</th><th>Distance from project</th></tr>
<tr><td>Bridle Concrete Resources Pty Limited</td><td>Kingfisher Road, Port Macquarie</td><td>Other Waste Facility</td><td>Operational</td><td>700 m E of Segment 6</td></tr>
<tr><td>Coles Supermarket</td><td>43 John Oxley Drive, Port Macquarie</td><td>Soft Plastic Drop-off Facility</td><td>Operational</td><td>60 m E of Segment 6</td></tr>
<tr><td>Port Macquarie Transfer Station</td><td>70 Kingfisher Road, Port Macquarie</td><td>Transfer Station</td><td>Operational</td><td>700 m E of Segment 6</td></tr>
<tr><td>Harvey Norman</td><td>140 Lake Road, Port Macquarie</td><td>E-waste Drop off facility</td><td>Operational</td><td>450 m S of Segment 7</td></tr>
<tr><td>Woolworths Supermarket</td><td>3 Bay Street, Port Macquarie</td><td>Soft Plastic Drop-off Facility</td><td>Operational</td><td>700 m NE of Segment 5</td></tr>
</table></td></tr>
<tr><td>Liquid Fuel Facilities</td><td>Nil records</td></tr>
<tr><td>Investigation or Management for Per- and Poly-Fluoroalkyl Substances</td><td>A search of the NSW EPA PFAS Investigation Program databases showed no facility within 1 km search radius from the site that is currently included in the program (access 10 May 2024).
A search of the Defence PFAS Investigation Program database showed no facility within 1 km search radius from the site that is currently included in the program (access 10 May 2024).
A search of the Airservices Australia National PFAS Management Program database showed no facility within 1 km search radius from the site that is currently included in the program (access 10 May 2024).</td></tr>
<tr><td>Mining titles</td><td>A search of the NSW Exploration and Mining Title Maps (MinView, NSW Statewide Seamless Geology) showed that there are currently no existing mining and exploration titles within a 3 km radius from the study area. The historical mining and exploration titles that have been issued in the proposed area are summarised below.</td></tr>
</table>

<table>
<tr><th>Landuses</th><th>Details</th></tr>
<tr><td></td><td>
<table>
<tr><th>Organisation</th><th>Resource</th><th>Year Ended</th></tr>
<tr><td>Nickel Leach Pty Limited</td><td>Minerals: Group 1 (Mo, Cu, Zn. Pb, Ni)</td><td>1968</td></tr>
<tr><td>National Electro Plating Co Pty Limited</td><td>Minerals: Group 1 (Co, Ni)</td><td>1981</td></tr>
<tr><td>Jervois Mining Limited</td><td>Minerals: Group 1, Group 10 (Co, Cr, Ni, Sc)</td><td>2001</td></tr>
<tr><td>Australian Hualong Pty Ltd</td><td>Minerals: Group 1</td><td>2012</td></tr>
<tr><td colspan="3">Note: Mo – Molybdenum, Cu – copper, Zn – zinc, Pb – lead, Ni – Nickel, Co – cobalt, Cr – chromium, Sc - scandium</td></tr>
</table>
</td></tr>
<tr><td>State Forests, National Parks or Wildlife Reserves</td><td>Table 3.1 for reference to state forests, national parks and/or wildlife reserves located within the study area.</td></tr>
</table>

5. Preliminary conceptual site model

A preliminary conceptual site model (CSM) was developed to provide an understanding of the potential for exposure to contaminants. The CSM draws together historical data, specific and regional geological, hydrogeological information, and the information provided from the site inspection to identify potential contamination sources, migration and exposure pathways and sensitive receptors for the project. As a preliminary CSM it is unknown if the identified pathways are actively present.

5.1 Sources

Based on the desktop review, site inspection and the Council list of contaminated sites in the area, the following potential contamination sources, and contaminants of potential concern (COPC) associated with each source were identified as summarised Table 5.1.

Table 5.1 Potential contamination sources

Segment	Location along segment	Source	Potential Contaminants of Concern
Potential sources intersecting and adjacent the different segments			
1	Wetlands surrounding areas of the proposed WWTP and associated facilities (Figure A-1 Appendix A)	Presence of low to high probability ASS	Acid sulfate soils
	Shed located within 20 m west of the proposed access road (see Photograph 9)	Several containers (with oils, lubricants, pesticides, etc) and wastes were found in the shed Shed building materials	Heavy metals, polycyclic aromatic hydrocarbon (PAH), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), phenols, asbestos, organochlorine pesticides (OCPs), organophosphate pesticides (OPPs)
	Residential and shed area located within the proposed compound	Building materials	Asbestos containing materials, lead based paints
	Select locations along segment	Illegal dumping of various wastes.	Asbestos, heavy metals, PAH, TRH, BTEXN, and polychlorinated biphenyls (PCBs)
	Select locations along segment	Use of herbicides and pesticides along the project for pest and weed control	OCPs, OPPs, arsenic and lead
2	Electrical substation located 314 m west of Segment 2 (potentially up-gradient)	Potential spills and leaks from use of the site, maintenance and fuelling.	Heavy metals, PAH, TRH, BTEXN, phenols, OCPs, OPPs, PCBs
	Former horticultural site located 300 m west of Segment 2 (potentially up-gradient)	Potential use of pesticides and herbicides during operation.	OCPs, OPPs, arsenic and lead, nutrients, pH
	Select locations along segment	Illegal dumping of various wastes	Asbestos, heavy metals, PAH, TRH, BTEXN, and PCBs
	Existing bitumen and road base materials along Thrumster Street	Impacts associated with the existing bitumen and road base materials (historical materials may be coal tar based) Historical fill from unknown sources	Heavy metals, PAH, TRH, BTEXN, phenols, asbestos, OCPs, OPPs and PCBs
	Select locations along segment 2 (Figure A-2)	There is a low probability of presence of NOA in some locations along the segment	NOA

Segment	Location along segment	Source	Potential Contaminants of Concern
	Final sections of Segments 3 and 4 near intersection with Tuffins Lane (Figure A-1 Appendix A)	Presence of low to high probability ASS	Acid sulfate soils
	Select locations along segment	Fill materials from unknown sources in highway/road construction, and other residential and commercial developments, including potential historical mining leases	Heavy metals, PAH, TRH, BTEXN, phenols, asbestos, OCPs, OPPs and PCBs
	Select locations along segment	Potential use of herbicides and pesticides adjacent the project areas for pest and weed control	OCPs, OPPs, arsenic, and lead
3, 4	Former Waste Management Site (located west, and intersects some portions of Segments 3 and 4)	Leaching of and disposal of materials associated with waste storage and treatment facility	Asbestos, heavy metals, PAH, TRH, BTEXN, OCPs, OPPs, PCBs and PFAS
	Port Macquarie Airport located west of the segments	Potential historical use of aqueous firefighting foams	PFAS
	Firing range located approximately 650 m south of Segment 4 (potentially up-gradient)	Use of ammunitions in the area	Lead
	Final sections of Segments 3 and 4 near intersection with Tuffins Lane (Figure A-1, Appendix A)	Presence of low to high probability ASS	Acid sulfate soils
	Select locations along segment	Illegal dumping of various wastes	Asbestos, heavy metals, PAH, TRH, BTEXN, and PCBs
	Select locations along segment	Potential use of herbicides and pesticides along the project for pest and weed controls	OCPs, OPPs, arsenic, and lead
5	Council pump station and former scrap yard and fuel storage (located at the end of the segment)	Potential spills and leaks from use of the site, maintenance and fuelling Impacts associated with the storage of scrap materials onsite	Heavy metals, PAH, TRH, BTEXN, OCPs, OPPs, PCBs
	Port Macquarie Airport located adjacent south of Segment 5 (potentially up-gradient)	Potential historical use of firefighting foams Potential spills and leaks from use of the site, maintenance and fuelling	PFAS, PAH, TRH, BTEX
	Residential property with large industrial shed used for fuel storage. located 1.8 km south of Segment 5 (potentially up-gradient)	Potential spills and leaks from use of the site as a fuel storage facility	PAH, TRH, BTEX, heavy metals
	Firing range located approximately 1 km south of the segment (potentially up-gradient)	Use of ammunitions in the area	Heavy metals
	Former scrap yard located 30 m north of one of the SPS compounds located along Hastings River Dr)	Impacts associated with the storage of scrap materials onsite	Heavy metals

Segment	Location along segment	Source	Potential Contaminants of Concern
	Former horticultural site located approximately 50 m south of the segment (potentially up-gradient)	Potential use of pesticides and herbicides during operation.	OCPs, OPPs, arsenic and lead
	Former Bus depot located 50 m north of the segment	Potential spills and leaks from use of the site, maintenance and fuelling	PAH, TRH, BTEXN
	Select locations along segment	Illegal dumping of various wastes.	Asbestos, heavy metals, PAH, TRH, BTEXN, and PCBs
	Existing bitumen and road base materials	Impacts associated with the existing bitumen and road base materials (historical materials may be coal tar based) Historical fill from unknown sources	Heavy metals, PAH, TRH, BTEXN, phenols, asbestos, OCPs, OPPs and PCBs
	Select locations along segment	Potential use of herbicides and pesticides along the project for pest and weed control	OCPs, OPPs, arsenic and lead
6	Former horticulture site located adjacent (south) of a portion of the segment (potentially upgradient)	Potential use of pesticides and herbicides during operation	OCPs, OPPs, arsenic and lead, nutrients, pH
	Chemical storage facility located adjacent west of the segment along John Oxley Dr	Potential spills and leaks due to reported unsatisfactory storage of chemicals	Heavy metals, PAH, TRH, BTEX, phenols, OCPs, OPPs and PCBs
	Former service station located adjacent east of segment 6 along John Oxley Dr	Potential spills and leaks from use of the site, maintenance and fuelling	PAH, TRH, BTEXN, heavy metals, OCPs, OPPs
	Select locations along segment 6 (Figure A-2)	There is a low probability of presence of NOA in some locations along the segment	NOA
	Select locations along segment	Illegal dumping of various wastes	Asbestos, heavy metals, PAH, TRH, BTEXN, and PCBs
	Existing bitumen and road base materials	Impacts associated with the existing bitumen and road base materials (historical materials may be coal tar based) Historical fill from unknown sources	Heavy metals, PAH, TRH, BTEXN, phenols, asbestos, OCPs, OPPs and PCBs
	Select locations along segment	Use of herbicides and pesticides along the project for pest and weed control	OCPs, OPPs, arsenic and lead
7	Former horticulture sites located adjacent of the segment	Potential use of pesticides and herbicides during operation	OCPs, OPPs, arsenic and lead
	Former Waste Management Site within Lake Innes Nature Reserve with the closest part located 100 m south (potentially upgradient of Segment 7)	Leaching of and disposal of materials associated with waste storage and treatment facility	Asbestos, heavy metals, PAH, TRH, BTEXN, OCPs, OPPs, PCBs and PFAS
	Former service stations located between 200 to 1000 m south of the segment (potentially upgradient of Segment 7)	Potential spills and leaks from use of the site, maintenance and fuelling	PAH, TRH, BTEXN, heavy metals, OCPs, OPPs
	Select locations along segment 7 (Figure 4)	There is a low probability of presence of NOA in some locations along the segment	NOA

Segment	Location along segment	Source	Potential Contaminants of Concern
	Select locations along segment	Illegal dumping of various wastes	Asbestos, heavy metals, PAH, TRH, BTEXN, and PCBs
	Existing bitumen and road base materials	Impacts associated with the existing bitumen and road base materials (historical materials may be coal tar based) Historical fill from unknown sources	Heavy metals, PAH, TRH, BTEX, phenols, asbestos, OCPs, OPPs and PCBs
	Select locations along segment	Use of herbicides and pesticides along the project for pest and weed controls	OCPs, OPPs, arsenic and lead

5.2 Pathways

The primary pathways by which current and future receptors could be exposed to the potential sources of contamination are considered to be:

– Direct contact (including ingestion) with potentially contaminated soil or groundwater
– Inhalation of potential contaminants in soil, if disturbed (particularly asbestos if present)
– Volatilisation to indoor or outdoor air and subsequent inhalation of potential hydrocarbon impacts from soil or groundwater
– Lateral migration of potential contaminants via surface water run-off to impact surface water (Fernbank Creek, Partridge Creek, Kooloonbung Creek and Hastings River)
– Vertical and horizontal migration of potential contaminants within the groundwater (where present)

5.3 Potential receptors

When evaluating potential adverse health/environmental effects from exposure to a contaminated site, all potentially exposed populations should be considered. For the Site, the key populations or receptors of interest are considered to include:

Human health receptors

– Current occupants of the project (e.g. workers)
– Intrusive maintenance workers during project construction
– Visitors to the project (e.g., members of the public - trespassers)
– Future workers on the project and associated infrastructure (commercial/industrial)
– Current and future occupants of surrounding properties (e.g., residents, workers, and visitors)
– Recreational users of water bodies
– Offsite groundwater usage

Environmental receptors

– Flora and fauna within the proposed project and surrounding land
– Surface water systems throughout the proposed project including Fernbank Creek, Partridge Creek, Kooloonbung Creek and Hastings River
– Groundwater beneath the proposed project and associated infrastructure

Based on the results of the desktop assessment, the overall likelihood for significant chemical contamination to be present along the proposed project is considered to be low. There is a high probability of encountering ASS during construction along Segments 1, 2, 3, 4 and beginnings of Segment 5. There is also low NOA potential located in portions of Segment 2, 6 and 7.

6. Conclusions and recommendations

GHD was engaged by Council to undertake a PSI for the proposed project which will include the following:

– New WWTP, including a recycled water plant within Lot 14, DP 1139180 on 433 Fernbank Creek Road, about 6 km west of Port Macquarie Central Business District
– Return treated effluent pipeline to Kooloonbung Creek
– Main access road to the WWTP and a flood proof all weather access road
– New sewer pump stations, sewer rising mains and recycled water mains
– Upgrade works at identified existing sewer pump stations (SPSs) to reduce the current load on the existing system
– Improvements to site access and electricity supply

The purpose of the PSI is to inform the EIS with regard to the potential contamination issues within the proposed project and provide recommendations for management and/or remediation measures to be implemented during construction and operation (if required). Based on the information contained within this assessment and the limitations outlined in Section 1.5, the following conclusions are made.

A summary of the findings from the site inspection, desktop review, information provided by Council and from searches of publicly available databases included the following:

– The proposed location of the WWTP including the recycled water plant and portions of the recycled water main, return effluent pipeline to Kooloonbung Creek and sewer rising mains are in an area surrounded by the wetlands of Patridge Creek and Fernbank Creek. There is minimal development in the area including the construction of a residential area and shed around 1979 based on the historical aerials.
– The majority of the rest of the mains are located along located along bitumen roads.
– The immediate area surrounding the project predominantly consists of bushland, wetlands, residential and commercial/industrial properties, as well as some scattered rural and agricultural properties.
– Segments 1, 2, 3, 4 and the beginning of Segment 5 are in areas with high and low probability of ASS occurrence. Artificial drainage works in Partridge Creek between 1890 to 1989 has resulted to an oxidation of ASS in the area. In 2003, a remediation strategy to reduce acid flux from Partridge Creek to the Hastings River estuary was implemented by containing the acidic groundwater and restoring the former hydrology of the freshwater backswamp.
– There is low NOA potential areas within portions of Segment 2, 6 and 7.
– There are no NSW EPA contaminated land records/notices reported within 500 m of the project proposed locations.
– Historical mining (Mo, Cu, Zn, Pb, Co, Ni, Sc, Cr) titles were identified in the project proposed locations; however, no obvious evidence of mining was observed on-site from the aerial photo review.

There is the potential to encounter the following during construction:

– ASS along Segments 1, 2 3 and 4 and the beginning of Segment 5
– Areas of potential NOA within Segments 2, 6 and 7

There is the potential for diffuse or isolated chemical contamination associated with:

– Potential for various anthropogenic wastes associated with residences, waste dumps, or due to illegal dumping in various locations along the project footprint
– Potential presence of asbestos containing materials and lead based paints in the building materials of the residential and shed structures
– Spills/leaks from agricultural equipment or from historical mining activities
– Use of herbicides and pesticides for weed spraying and chemicals associated for weed control or horticultural activities

- Fill materials from unknown sources during the construction of the airport, racecourse, highway/road construction, and other residential and commercial/industrial developments, including potential historical mining leases
- Spills/leaks from petroleum hydrocarbon use and storage (diesel and premium unleaded) within 1 km of the roadways adjacent the project and identified offsite service stations
- Potential spills and leaks due to reported unsatisfactory storage of chemicals located adjacent west of the segment along John Oxley Drive
- Use of land adjacent the project as roadways with accumulation and runoff containing fuel and oil residues potentially directed to road verges and drainage lines (isolated to areas adjacent to roads)
- Wastes from the former Waste Management Site within the Lake Innes Nature Reserve, former waste management facilities located in the current location of the airport and scrap yards in several locations
- Potential historical use of aqueous firefighting foams at the Port Macquarie Airport
- Use of ammunitions in the firing range

Based on the results of the desktop assessment, the overall likelihood for significant chemical contamination to be present along the proposed project is considered to be low. There is a high probability of encountering ASS during construction along Segments 1, 2, 3, 4 and beginnings of Segment 5. There is also low NOA potential located in portions of Segment 2, 6 and 7.

It is considered that the risks from disturbance of potential contaminated soils within the project can be managed during the proposed works, by implementation of the following:

- Development of a Contaminated Soil Management Plan (CSMP) to manage any contamination encountered during the demolition and construction of the project and to ensure the completed works are suitable for the intended land use. The CSMP should include the following:
  - Provision for further detailed assessment where appropriate to confirm the conclusions of this preliminary assessment and to determine whether any specific remediation or management of areas is required. The further assessment should be based on the following:
    - Potential areas and types of contamination identified in this assessment.
    - The potential for exposure to workers and to end-users based respectively on the nature of the proposed construction works and the final design of the project.
  - Appropriate management controls to minimise the potential for exposure of contamination to workers and recreational users within the project both during and post construction.
  - Description of appropriate excavation, validation, management and/or disposal requirements for potentially contaminated materials, if identified by further assessment or encountered during the construction of the project.
  - Sampling and analysis requirements for assessment of potentially contaminated soils for re-use or for waste classification prior to offsite disposal.
  - Contingency plans including unexpected finds protocols for potentially contaminated soils (if encountered) including landfill or anthropogenic waste and PACMs.
- Development of an NOA Management Plan to provide a framework for safely working with NOA encountered during the construction and operation of the project.
- Application of the Acid Sulfate Soil Management Plan for Pipe Infrastructure Installations during excavation works.
- Any future contamination reports should be prepared or reviewed and approved by an appropriately qualified environmental consultant.

7. References

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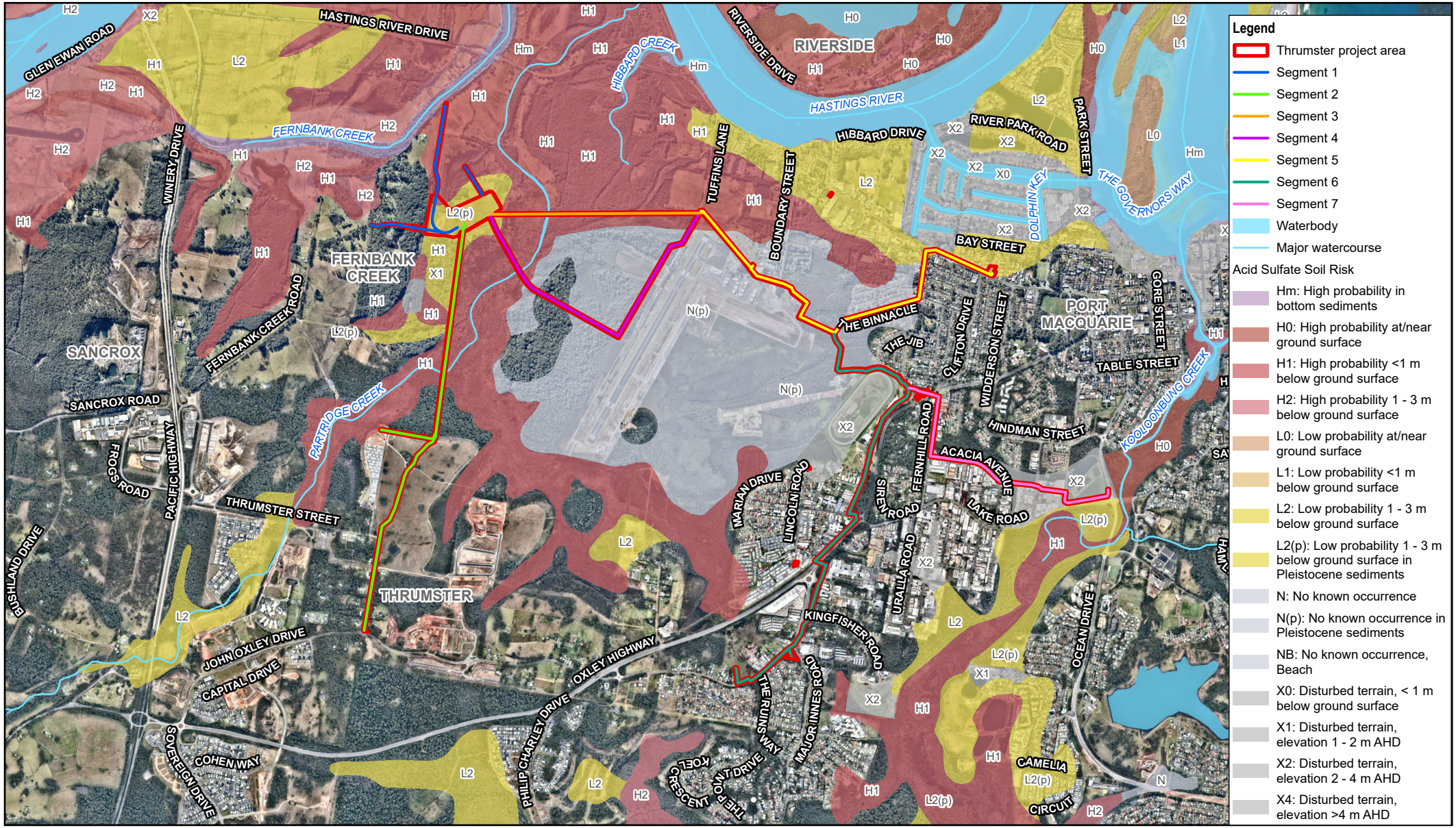
PMHC, Acid Sulfate Soil Management Plan for Pipe Infrastructure Installations

WaterNSW All Groundwater Database. www.realtimedata.waternsw.com.au. (Accessed 29 February 2024)

Appendices

Appendix A

Figures



Paper Size ISO A4

0 0.35 0.7 1.05 1.4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

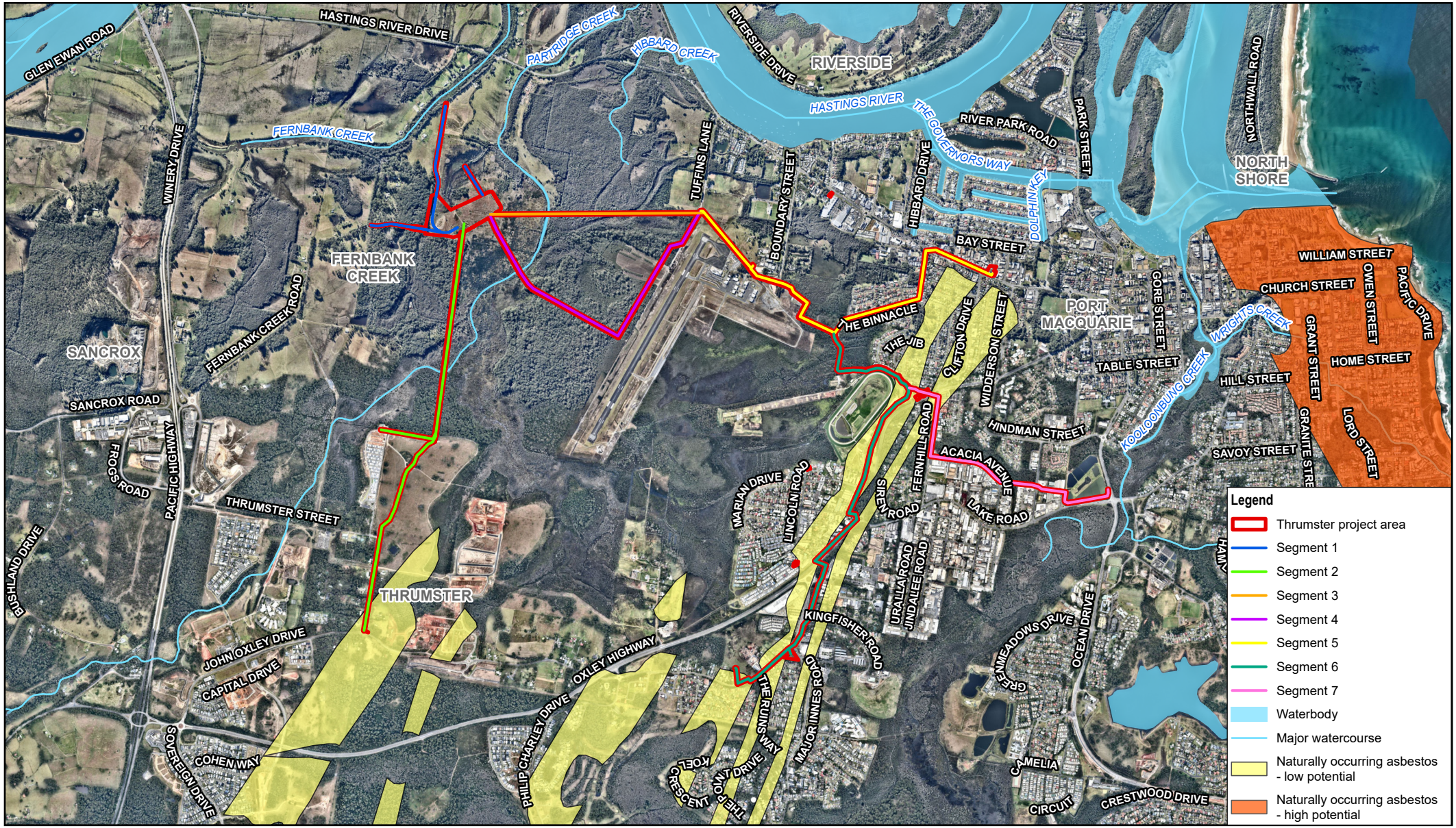
Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

Acid Sulfate Soils Risk probability map

FIGURE A.1

N:\AU\Newcastle\Projects\22\12587218\GIS\Maps\12611129_Thrumster_Contam_PSI.aprx
Print date: 26 Jun 2024 - 12:42

Data source: NSW Government: DPE Acid Sulfate Soil Risk, 2022; PMHC: Infrastructure data, 2024; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/10/2023. Created by: fmackay



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Kilometres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Port Macquarie-Hastings Council
Thrumster Wastewater Scheme
Soils and Contamination
Preliminary Site Investigations

Project No. **12611129**
Revision No. **0**
Date **26/06/2024**

Naturally occurring asbestos

FIGURE A.2

N:\AU\Newcastle\Projects\22\12587218\GIS\Maps\12611129_Thrumster_Contam_PSI.aprx
Print date: 26 Jun 2024 - 12:41

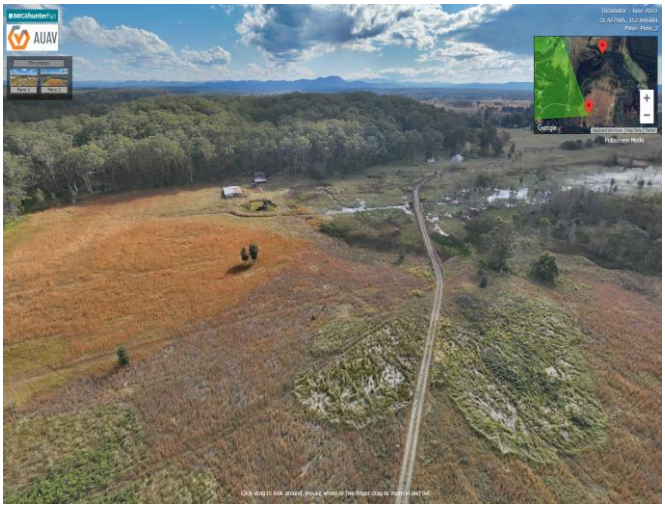
Data source: PMHC: Naturally occurring asbestos, 2023 PMHC: Infrastructure data, 2023; LPI: DTDB / DCDB, 2023; Nearmap WMS Server: Aerial imagery - date extracted 12/10/2023. Created by: fmackay

Appendix B

Photolog

Photo Log

Photograph 1 *The proposed WWTP location is currently vacant and covered with grass and surrounded by bushland with dense vegetation (Segment 1)*



Photograph 2 *Aerial looking west/northwest from the proposed WWTP location. The area is generally undeveloped and covered with grass. An existing unsealed access road is also visible traversing the area with some structures were also visible but was not inspected during the site inspection except of a shed as shown in Photograph 9. A densely vegetated bushland is located further to the west (Segment 1). (Aerial provided by Council)*

Photograph 3 *Aerial looking North from the proposed WWTP location. Located to the north is a wetland and further is a cleared area with sparse vegetation (Segment 1). (Aerial provided by Council)*

Photograph 4 *Aerial looking east from the proposed WWTP. Patridge Creek and its associated wetland is visible and further to the east is a densely vegetated bushland (Segment 1, 3 and 4). (Aerial provided by Council)*

Photograph 5 *Aerial looking south from the WWTP showing densely vegetated bushland (Segment 1 and 2). (Aerial provided by Council)*

Photograph 6 *Swale for inflow to the wetland (Segment 1)*

Photograph 7 *The control box and hydraulic oil hopper for the hydraulic creek flow gate use for ASS management located north of the proposed WWTP (Segment 1)*

Photograph 8 *Hydraulic creek flow gate located north of the proposed WWTP (Segment 1)*

Photograph 9 *Containers (with oils, lubricants, pesticides, etc) and wastes in the shed located west of the proposed WWTP. The dwelling beside the shed was inaccessible at the time of the assessment (Segment 1)*

Photograph 10 *Soil stockpile and building materials were noted near the retirement facility development located at the end of the proposed PC line in Segment 2. An unsealed access road was also visible (Segment 2)*

Photograph 11 *Photo showing the area between the bushland and Thrumster Street along the proposed Recycled Water Main in Segment 2. This portion of the segment runs along an unsealed access road. The surrounding area is undeveloped and covered with grass and sparse vegetation*

Photograph 12 *Photo looking towards Thrumster Street. This portion of Segment 2 runs along bitumen roads, with some low density residential areas and vegetation in the surrounding areas*

Photograph 13 *Photo looking towards the airport between Segments 3, 4 and 5 at Tuffins Lane*

Photograph 14 *Photo looking towards the airport with some wastes observed along Tuffins Lane (Segments 3, 4 and 5)*

Photograph 15 *Photo looking towards the airport along Tuffins Lane. A stockpile mound and stored materials (i.e. cones, containers) was visible (Segment 5)*

Photograph 16 *Photo showing Hastings River Drive Commercial establishments in the surrounding areas (Segment 5)*

Photograph 17 Photo showing the current Council pump station located at the end of Segment 5

Photograph 18 Photo showing Kemp Street with residential areas located adjacent to it (Segment 5)

Photograph 19 Photo showing The Binnacle with residential areas and vegetated bushland located adjacent to it (Segment 5)

Photograph 20 Photo showing the nearby Biological stewardship Site located adjacent The Binnacle (Segment 5)

Photograph 21 *Photo showing areas open field and dense vegetation in the wetland between Tuffins Lane and the Binnacle. No surface water was observed at the time of inspection (Segment 5)*

Photograph 22 *Photo showing the Racecourse along Lady Nelson Drive. A drainage channel adjacent the racecourse is also visible (Segment 6)*

Photograph 23 *An unsealed portion of Lady Nelson Drive located west of the Racecourse (Segment 6)*

Photograph 24 *Photo looking towards the southern portion of the Racecourse. Some soil and material stockpiles were visible. Surface water ponding within the southern portion of the racecourse was also visible (Segment 6)*

Photograph 25 *Photo showing unsealed pathways towards the airport from the racecourse (Segment 6)*

Photograph 26 *Some wastes observed in areas near the Racecourse (Segment 6)*

Photograph 27 *Photo showing Acacia Avenue surround by industrial areas and densely vegetated bushland (Segment 7)*

Photograph 28 *Photo looking towards the aeration ponds of the existing WWTP (Segment 7)*

Appendix C

Water NSW Identified Water Bores

WaterNSW
Work Summary

GW072717

Licence: 30WA317912 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC,STOCK
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date:
Completion Date: 12/07/1994
Final Depth: 31.00 m
Drilled Depth: 31.00 m

Contractor Name: Douglas Charles JACKWITZ
Driller: William Douglas Jackwitz
Assistant Driller:

Property: N/A 461 Fernbank Creek Rd PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 9.000
Salinity Description: Good
Yield (L/s): 2.460

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT18 DP754434
Licensed:	MACQUARIE	MACQUARIE	Whole Lot //

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6523729.000
Easting: 485185.000
Latitude: 31°25'15.6"S
Longitude: 152°50'38.9"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	31.00	168			Rotary
1	1	Casing	Pvc Class 9	-0.30	31.00	160			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	18.00	31.00	160		0	Sawn, PVC Class 9, SL: 0.1mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.00	23.00	1.00	Unknown			0.61			
26.00	27.00	1.00	Unknown	9.00		1.85		01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	20.00	20.00	Clay	Clay	
20.00	28.00	8.00	Shale	Shale	
28.00	31.00	3.00	Shale - hard	Shale	

***** End of GW072717 *****

WaterNSW
Work Summary

GW034732

Licence: 30BL027843 **Licence Status:** ACTIVE

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Well
Work Status:
Construct.Method:
Owner Type: Private

Commenced Date: **Final Depth:** 3.20 m
Completion Date: **Drilled Depth:**

Contractor Name: (None)
Driller:
Assistant Driller:

Property: N/A NSW **Standing Water Level (m):**
GWMA: - **Salinity Description:**
GW Zone: - **Yield (L/s):**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	49
Licensed:	MACQUARIE	MACQUARIE	Whole Lot //

Region: 30 - North Coast **CMA Map:**
River Basin: 207 - HASTINGS RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6519340.000 **Latitude:** 31°27'38.3"S
Elevation Source: (Unknown) **Easting:** 487780.000 **Longitude:** 152°52'17.0"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Timber	0.00	0.00	1828			

*** End of GW034732 ***

WaterNSW
Work Summary

GW062937

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): FARMING

Work Type: Excavation
Work Status: Supply Obtained
Construct.Method: > 100 sq.m.
Owner Type: Private

Commenced Date:
Completion Date:
Final Depth: 3.60 m
Drilled Depth:

Contractor Name: (None)
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	380
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6522757.000
Easting: 488093.000
Latitude: 31°25'47.3"S
Longitude: 152°52'29.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.MAP

***** End of GW062937 *****

WaterNSW
Work Summary

GW062939

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): FARMING

Work Type: Excavation
Work Status: Supply Obtained
Construct.Method: > 100 sq.m.
Owner Type: Private

Commenced Date:
Completion Date:
Final Depth: 6.00 m
Drilled Depth:

Contractor Name: (None)
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	381
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6522665.000
Easting: 488067.000
Latitude: 31°25'50.3"S
Longitude: 152°52'28.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.MAP

*** End of GW062939 ***

WaterNSW
Work Summary

GW062940

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): FARMING

Work Type: Excavation
Work Status: Supply Obtained
Construct.Method: > 100 sq.m.
Owner Type: Private

Commenced Date:
Completion Date:
Final Depth: 3.60 m
Drilled Depth:

Contractor Name: (None)
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	381
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6522603.000
Easting: 488067.000
Latitude: 31°25'52.3"S
Longitude: 152°52'28.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.MAP

***** End of GW062940 *****

WaterNSW
Work Summary

GW065479

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): INDUSTRIAL

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 09/01/1992
Final Depth: 39.60 m
Drilled Depth: 39.60 m

Contractor Name: Watermin Drillers Pty Ltd
Driller: Kevin Harold Norrie
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 2.700
Salinity Description: Good
Yield (L/s): 3.900

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 3 DP602958
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522759.000
Easting: 489360.000
Latitude: 31°25'47.3"S
Longitude: 152°53'17.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	22.90	190			Rotary Air
1		Hole	Hole	22.90	39.60	165			Percussion
1	1	Casing	Steel	-0.30	24.10	165			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.80	23.10	0.30	Fractured	2.70		0.75	23.10		
26.20	26.40	0.20	Fractured	2.70		1.26	26.40		
32.90	33.00	0.10	Fractured	2.70		1.89	33.00		

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.60	0.60	CLAY	Unknown	
0.60	2.70	2.10	BLACK SOIL	Unknown	
2.70	3.60	0.90	SAND	Unknown	
3.60	22.80	19.20	SANDY YELLOW CLAY	Unknown	
22.80	39.60	16.80	BLACK SHALE WITH BANDS OF QUARTZ	Unknown	

***** End of GW065479 *****

WaterNSW
Work Summary

GW065970

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): RECREATION (GROU

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 05/06/1991
Final Depth: 36.00 m
Drilled Depth: 36.00 m

Contractor Name: Douglas Charles JACKWITZ
Driller: Douglas Charles Jackwitz
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 8.100
Salinity Description:
Yield (L/s): 3.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 6 DP790668
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521311.000
Easting: 488306.000
Latitude: 31°26'34.3"S
Longitude: 152°52'37.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	36.00	168			Rotary Air
1	1	Casing	Pvc Class 9	-0.30	36.00	160			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	20.00	36.00	160		1	Sawn, PVC Class 9, SL: 150.0mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
20.00	28.00	8.00	Fractured			0.50		01:00:00	
28.00	36.00	8.00	Fractured	8.10		2.50		01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	20.00	20.00	CLAY	Unknown	
20.00	28.00	8.00	SOFT SHALE	Unknown	
28.00	36.00	8.00	FRACTURED BASALT	Unknown	

***** End of GW065970 *****

WaterNSW
Work Summary

GW068734

Licence: 30WA311498 **Licence Status:** CURRENT

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date: 04/09/1990 **Final Depth:** 46.00 m
Completion Date: 04/09/1990 **Drilled Depth:** 46.00 m

Contractor Name: Douglas Charles JACKWITZ
Driller: Douglas Charles Jackwitz
Assistant Driller:

Property: N/A 511 FERNBANK CREEK ROAD PORT MACQUARIE NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s): 0.600

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 4 DP738164
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 4//738164

Region: 30 - North Coast **CMA Map:**
River Basin: 207 - HASTINGS RIVER **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6523245.000 **Latitude:** 31°25'31.3"S
Elevation Source: Unknown **Easting:** 484903.000 **Longitude:** 152°50'28.2"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	46.00	160			Rotary Air
1	1	Casing	Pvc Class 9	0.00	46.00	150			Seated on Bottom
1	1	Opening	Slots - Vertical	22.00	38.00	150		1	Sawn, PVC, SL: 150.0mm, A: 3.00mm
1	1	Opening	Slots - Vertical	34.00	46.00	150		2	Sawn, PVC, SL: 150.0mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.00	30.00	8.00	Unknown						
32.00	46.00	14.00	Unknown			0.60			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	TOPSOIL GRAVEL	Unknown	
2.00	12.00	10.00	CLAY	Unknown	
12.00	32.00	20.00	SOFT SHALE	Unknown	
32.00	44.00	12.00	HARD SHALE	Unknown	
44.00	46.00	2.00	BASALT	Unknown	

***** End of GW068734 *****

WaterNSW
Work Summary

GW069071

Licence: 30WA317864 **Licence Status:** CURRENT

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 07/02/1991
Final Depth: 27.00 m
Drilled Depth: 27.00 m

Contractor Name: Douglas Charles JACKWITZ
Driller: Douglas Charles Jackwitz
Assistant Driller:

Property: N/A NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 1.300
Salinity Description:
Yield (L/s): 1.500

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 2 DP1001888
Licensed:	MACQUARIE	MACQUARIE	Whole Lot //

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522390.000
Easting: 488842.000
Latitude: 31°25'59.2"S
Longitude: 152°52'57.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.GIS

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	27.00	168			Rotary Air
1	1	Casing	Pvc Class 9	0.00	27.00	150			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	18.00	27.00	150		1	Sawn, PVC Class 9, SL: 150.0mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.00	27.00	5.00	Fractured	1.30		1.50			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

0.00	6.00	6.00		Sand	
6.00	20.00	14.00		Clay	
20.00	22.00	2.00		Shale	
22.00	27.00	5.00		Basalt	

Remarks

07/02/1991: ACC = 7

***** End of GW069071 *****

WaterNSW
Work Summary

GW070478

Licence: 30BL151019
Licence Status: ACTIVE

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type:
Work Status:
Construct.Method: Rotary Air
Owner Type:

Commenced Date:
Completion Date: 06/04/1993
Final Depth: 18.00 m
Drilled Depth: 18.00 m

Contractor Name: ALLAN JAMES HIBBERT
Driller: Allan James Hibbert
Assistant Driller:

Property: N/A NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 6.000
Salinity Description:
Yield (L/s): 150.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT3DP611526
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 3//611526

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 10.00 m (A.H.D.)
Elevation Source: Est. Contour 8-15M.
Northing: 6520228.000
Easting: 484612.000
Latitude: 31°27'09.3"S
Longitude: 152°50'17.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	18.00	110			Rotary Air
1	1	Casing	P.V.C.	0.00	18.00	110			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
0.00	12.00	12.00	Unconsolidated	12.00					
12.00	18.00	6.00	Fractured	6.00		0.15			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

0.00	12.00	12.00	Clay	Clay	
12.00	18.00	6.00	Rock	Rock	

***** End of GW070478 *****

WaterNSW
Work Summary

GW070986

Licence: 30WA311803
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore open thru rock
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 01/03/1993
Final Depth: 45.00 m
Drilled Depth: 45.00 m

Contractor Name: K & W NORRIE DRILLING PTY LTD
Driller: Kevin Harold Norrie
Assistant Driller:

Property: N/A NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 27.000
Salinity Description:
Yield (L/s): 0.630

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	PT POR 590 LT 1
Licensed:	MACQUARIE	MACQUARIE	Whole Lot //

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 10.00 m (A.H.D.)
Elevation Source: Est. Contour 8-15M.
Northing: 6519463.000
Easting: 488150.000
Latitude: 31°27'34.3"S
Longitude: 152°52'31.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	18.00	150			Rotary Air
1		Hole	Hole	18.00	45.00	125			Rotary Air
1	1	Opening	Slots	0.00	18.00			0	PVC Class 9
1	1	Casing	Pvc Class 9	0.00	18.00	150			Driven into Hole, Glued

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
32.00	33.00	1.00	Fractured	27.00		0.63	45.00		

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	Clay - red	Clay	
6.00	17.00	11.00	Shale - purple	Shale	
17.00	45.00	28.00	Shale - black	Shale	

***** End of GW070986 *****

WaterNSW
Work Summary

GW070994

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 01/02/1993
Final Depth: 18.00 m
Drilled Depth: 18.00 m

Contractor Name: LEON FREDERICK HOOK
Driller: Leon Frederick Hook
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 2.000
Salinity Description: Good
Yield (L/s): 1.300

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 4 DP 617732
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 15.00 m (A.H.D.)
Elevation Source: Est. Contour 8-15M.
Northing: 6521096.000
Easting: 489203.000
Latitude: 31°26'41.3"S
Longitude: 152°53'11.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	18.00	200			Rotary
1		Annulus	Waterworn/Rounded	10.00	18.00	200			
1	1	Casing	Pvc Class 6	0.00	18.00	125			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	10.00	18.00	125		1	Mechanically Slotted, PVC, SL: 0.8mm, A: 0.30mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
13.00	13.50	0.50	Unconsolidated	8.00	13.00	0.20	14.00		
16.00	16.50	0.50	Unconsolidated	2.00	8.00	0.65	18.00	01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Topsoil	Topsoil	
1.00	15.00	14.00	Clay - red	Clay	
15.00	16.00	1.00	Slate - grey	Slate	
16.00	18.00	2.00	Clay - grey	Clay	

***** End of GW070994 *****

WaterNSW
Work Summary

GW073051

Licence: 30WA312108
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 08/09/1994
Final Depth: 17.00 m
Drilled Depth: 17.00 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property: NIXON'S 618 Oxley Hwy PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 20.000
Salinity Description: Good
Yield (L/s): 0.500

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 12 DP22676
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 12//22676

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6519568.000
Easting: 487298.000
Latitude: 31°27'30.8"S
Longitude: 152°51'58.7"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.GIS

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	15.00	195			Rotary
1		Hole	Hole	15.00	17.00	165			Percussion
1		Annulus	(Unknown)	7.00	17.00				Graded, Q:0.030m3
1	1	Casing	P.V.C.	-0.20	17.00	135			Cemented, Glued
1	1	Opening	Slots - Vertical	10.00	15.00	135		1	Sawn, PVC, SL: 100.0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
12.00	13.00	1.00	Unconsolidated	2.00		0.50	16.00	01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	Soil	Soil	
0.50	15.50	15.00	Coffee Rock	Rock	
15.50	17.00	1.50	Serpentine	Serpentine	

***** End of GW073051 *****

WaterNSW
Work Summary

GW073176

Licence: 30WA312162 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type:

Commenced Date: **Final Depth:** 10.60 m
Completion Date: 08/12/1994 **Drilled Depth:** 10.60 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property: JENKINS' 8 Fernhill Rd PORT MACQUARIE 2444 NSW **Standing Water Level (m):** 4.000
GWMA: - **Salinity Description:**
GW Zone: - **Yield (L/s):** 0.600

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 4 DP 262041
Licensed:	MACQUARIE	MACQUARIE	Whole Lot //

Region: 30 - North Coast **CMA Map:**
River Basin: - Unknown **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6521543.000 **Latitude:** 31°26'26.8"S
Elevation Source: Unknown **Easting:** 489172.000 **Longitude:** 152°53'09.8"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	10.60	185			Rotary
1	1	Casing	P.V.C.	-0.40	10.60	135			Glued
1	1	Opening	Slots - Vertical	6.00	10.00	135		0	Sawn, PVC, SL: 0.1mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
6.00	7.00	1.00	Unknown	4.00		0.60		01:00:00	2200.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments

0.00	0.20	0.20	Soil	Unknown	
0.20	1.50	1.30	Clay	Clay	
1.50	10.00	8.50	Shale	Shale	
10.00	10.60	0.60	Basalt	Basalt	

***** End of GW073176 *****

WaterNSW
Work Summary

GW073614

Licence: 30WA312210
Licence Status: CURRENT

Authorised Purpose(s): STOCK
Intended Purpose(s): STOCK

Work Type: Bore
Work Status:
Construct.Method: Auger
Owner Type: Private

Commenced Date:
Completion Date: 04/09/1995
Final Depth: 15.00 m
Drilled Depth: 15.00 m

Contractor Name: H2O DRILLING
Driller: Allan James Hibbert
Assistant Driller:

Property: HOLLIS' 149 Lake Rd PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 5.000
Salinity Description: Very Good
Yield (L/s): 0.750

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 5 DP22596
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 5//22596

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521020.000
Easting: 490798.000
Latitude: 31°26'43.8"S
Longitude: 152°54'11.4"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,ACC.GIS

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	12.50	14.00	140			Seated on Bottom, Glued

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
10.00	15.00	5.00	Fractured	5.00	12.00	0.75	15.00	02:00:00	80.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	10.00	10.00		Clay	
10.00	15.00	5.00	Soft Soap Shale	Shale	

Remarks

04/09/1995: 80 mg/L.

***** End of GW073614 *****

WaterNSW
Work Summary

GW300165

Licence: 30WA311628
Licence Status: CURRENT

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type: Private

Commenced Date:
Completion Date: 17/09/1991
Final Depth: 50.00 m
Drilled Depth: 50.00 m

Contractor Name: Douglas Charles JACKWITZ
Driller: Douglas Charles Jackwitz
Assistant Driller:

Property: N/A NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 12.300
Salinity Description:
Yield (L/s): 0.600

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 51 DP746181
Licensed:	MACQUARIE	MACQUARIE	Whole Lot //

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6520872.000
Easting: 490795.000
Latitude: 31°26'48.6"S
Longitude: 152°54'11.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	50.00	168			Rotary Air
1	1	Casing	Pvc Class 9	-0.30	50.00	160			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	20.00	26.00	160		1	Sawn, PVC, SL: 150.0mm, A: 3.00mm
1	1	Opening	Slots - Vertical	32.00	38.00			2	Sawn, PVC, SL: 150.0mm, A: 3.00mm
1	1	Opening	Slots - Vertical	44.00	50.00			3	Sawn, PVC, SL: 150.0mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.00	22.00	4.00	Unknown	12.30		0.60		01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	CLAY	Unknown	
6.00	12.00	6.00	WHITE SHALE	Unknown	
12.00	18.00	6.00	SHALE	Unknown	
18.00	22.00	4.00	WHITE GREY BASALT	Unknown	
22.00	24.00	2.00	SOAPSTONE	Unknown	
24.00	34.00	10.00	GREY BASALT WITH QUARTZ	Unknown	
34.00	44.00	10.00	BASALT	Unknown	
44.00	50.00	6.00	GREY BASALT	Unknown	

***** End of GW300165 *****

WaterNSW
Work Summary

GW300628

Licence: 30WA312491
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type:

Commenced Date:
Completion Date: 20/01/1997
Final Depth: 21.00 m
Drilled Depth: 21.00 m

Contractor Name: H2O DRILLING
Driller: Allan James Hibbert
Assistant Driller:

Property: BARRS' 7 Hayworth Ave PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 3.000
Salinity Description:
Yield (L/s): 350.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 12 DP260604
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 12//260604

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522277.000
Easting: 489724.000
Latitude: 31°26'02.9"S
Longitude: 152°53'30.7"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	21.00	155			Rotary Air
1	1	Opening	Slots	17.00	21.00	140		0	Sawn, PVC, SL: 0.5mm, A: 20.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.00	18.50	0.50	Unknown	3.00	12.00	350.00	18.00	01:00:00	40.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	17.50	17.50	Clay	Unknown	

17.50	21.00	3.50	Soap stone	Unknown	

***** End of GW300628 *****

WaterNSW
Work Summary

GW300990

Licence: 30BL150954
Licence Status: ACTIVE

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date:
Completion Date: 08/11/1992
Final Depth: 30.00 m
Drilled Depth: 30.00 m

Contractor Name: H2O DRILLING
Driller: Allan James Hibbert
Assistant Driller:

Property: N/A 17 Thrumster St PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 30.000
Salinity Description: Poor
Yield (L/s): 0.130

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 3 DP613209
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 3//613209

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6520634.000
Easting: 484567.000
Latitude: 31°26'56.1"S
Longitude: 152°50'15.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	30.00	110			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
0.00	30.00	30.00	Unknown	30.00		0.13	30.00		

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	30.00	30.00	CLAY	Unknown	

Remarks

08/11/1992: Form A Remarks:
HARD CLAY

***** End of GW300990 *****

WaterNSW
Work Summary

GW301108

Licence: 30WA312580
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date:
Completion Date: 03/04/1998
Final Depth: 29.00 m
Drilled Depth: 29.00 m

Contractor Name: LEON FREDERICK HOOK
Driller: Leon Frederick Hook
Assistant Driller:

Property: " HOFFMAN'S " PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 10.000
Salinity Description: Good
Yield (L/s): 0.380

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 1 DP734943
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 1//734943

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6523143.000
Easting: 484857.000
Latitude: 31°25'34.6"S
Longitude: 152°50'26.4"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	29.00	195			Rotary Air
1		Annulus	Crushed Aggregate	2.00	29.00				Ungraded, Q:0.500m3
1	1	Casing	Pvc Class 9	0.00	29.00	137			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	22.00	29.00	137		0	Sawn, PVC Class 9, SL: 100.0mm, A: 2.50mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
24.00	24.50	0.50	Unknown	10.00		0.38	26.00	01:00:00	600.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	top soil	Unknown	
1.00	24.00	23.00	red to whith clay	Unknown	
24.00	29.00	5.00	decomposed basalt yellow	Unknown	

***** End of GW301108 *****

WaterNSW
Work Summary

GW302339

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): COMMERCIAL

Work Type: Bore
Work Status: Filled
Construct.Method: Rotary Air
Owner Type:

Commenced Date:
Completion Date: 26/11/1994
Final Depth: 41.00 m
Drilled Depth: 41.00 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s): 0.200

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 5 DP877124
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521626.000
Easting: 489094.000
Latitude: 31°26'24.1"S
Longitude: 152°53'06.8"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	8.00	195			Rotary Air
1		Hole	Hole	8.00	41.00	165			Down Hole Hammer

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
39.00	40.00	1.00	Unknown			0.20	40.00		4000.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	SOIL CLAY	Unknown	

0.50	8.00	7.50	YELLOW SHALE	Unknown	
8.00	41.00	33.00	BASALT	Unknown	

***** End of GW302339 *****

WaterNSW
Work Summary

GW302494

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): COMMERCIAL

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type:

Commenced Date:
Completion Date: 20/12/1994
Final Depth: 14.50 m
Drilled Depth: 14.50 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 5.000
Salinity Description: Good
Yield (L/s): 0.300

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LOT 2 DP262429
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6520762.000
Easting: 489071.000
Latitude: 31°26'52.1"S
Longitude: 152°53'05.9"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	14.50	195			Rotary Air
1		Annulus	(Unknown)	1.00	14.50				Graded, Q:0.300m3
1	1	Casing	P.V.C.	-0.30	14.50	135			Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	7.00	14.00	135		0	PVC, SL: 100.0mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
12.50	13.00	0.50	Unknown	5.00		0.30		02:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	topsoil	Topsoil	
0.50	5.00	4.50	clay	Clay	
5.00	7.00	2.00	yellow shale	Shale	
7.00	8.50	1.50	clay	Clay	
8.50	14.50	6.00	serpentine	Serpentine	

Remarks

09/06/2011: Karla Abbs, 9-Jun-2011: Removed invalid codes from drillers log

***** End of GW302494 *****

WaterNSW
Work Summary

GW303087

Licence: 30WA312873
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 04/02/2002
Final Depth: 40.50 m
Drilled Depth: 40.50 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property: SPRAGGON 901 Oxley Hwy PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 4 DP 221913
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 4//221913

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6519688.000
Easting: 484555.000
Latitude: 31°27'26.8"S
Longitude: 152°50'14.8"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	27.00	195			Rotary Air
1		Hole	Hole	27.00	40.50	140			Down Hole Hammer
1		Annulus	Waterworn/Rounded	10.00	40.50				Graded, Q:0.350m3
1	1	Casing	Pvc Class 9	-0.03	28.50	115	105		Seated on Bottom, Glued
1	1	Casing	Pvc Class 9	-0.03	28.00	140	126		Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	28.50	40.50	115		0	Mechanically Slotted, PVC Class 9, SL: 200.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
36.00	36.70	0.70	Unknown	16.00		1.00	40.50	01:00:00	700.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.05	0.05	Topsoil	Topsoil	
0.05	1.00	0.95	Dry Tan and Grey Mottled Clay	Clay	
1.00	8.00	7.00	Dry Silty White Clay	Clay	
8.00	16.00	8.00	Weathered Silt Stone	Siltstone	
16.00	23.00	7.00	Weathered Basalt	Basalt	
23.00	25.00	2.00	Very Soft Silt Stone	Siltstone	
25.00	27.00	2.00	Weathered Basalt	Basalt	
27.00	32.00	5.00	Medium Strength Silt Stone	Siltstone	
32.00	36.00	4.00	Medium Strength Basalt	Basalt	
36.00	36.70	0.70	Water Cut	Basalt	
36.70	40.50	3.80	Medium Strength Basalt	Basalt	

Remarks

10/06/2011: Karla Abbs, 10-06-2011: Removed invalid codes from drillers log

***** End of GW303087 *****

WaterNSW
Work Summary

GW303105

Licence: 30WA317940 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 08/02/2002
Final Depth: 15.00 m
Drilled Depth: 15.00 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property: WILSON'S 3 MELALEUCA CL PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 10 DP 250674
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 10//250674

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522738.000
Easting: 489846.000
Latitude: 31°25'48.0"S
Longitude: 152°53'35.4"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	9.00	195			Rotary Air
1		Hole	Hole	9.00	15.00	150			Rotary Air
1		Annulus	Waterworn/Rounded	1.00	14.40				Graded, Q:0.130m3
1	1	Casing	Pvc Class 9	-0.03	5.40	115	105		Seated on Bottom, Glued
1	1	Casing	Pvc Class 9	-0.03	9.00	160	150		Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	5.40	14.40	115		0	Mechanically Slotted, PVC Class 9, SL: 200.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
12.00	13.00	1.00	Unknown	3.00		1.25	15.00		300.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Topsoil	Topsoil	
2.00	3.00	1.00	Brown Sand (Fill)	Fill	
3.00	8.00	5.00	Wet Black Silty Clay	Silty Clay	
8.00	11.00	3.00	Moist Grey Clay	Clay	
11.00	12.00	1.00	Weathered Basalt	Basalt	
12.00	13.00	1.00	Water Cut	Basalt	
13.00	15.00	2.00	Weathered Basalt	Basalt	

Remarks

10/06/2011: Karla Abbs, 10-06-2011: Removed invalid codes from drillers log

***** End of GW303105 *****

WaterNSW
Work Summary

GW303133

Licence: 30WA312841 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status: Filled
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 22/11/2001
Final Depth: 39.00 m
Drilled Depth: 39.00 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property: ARTHUR - PFEIL'S 306 Oxley Hwy PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 2 DP 581359
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 2//581359

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521484.000
Easting: 488965.000
Latitude: 31°26'28.7"S
Longitude: 152°53'01.9"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	3.50	195			Rotary Air
1		Hole	Hole	3.50	39.00	165			Down Hole Hammer

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.05	0.05	Topsoil	Topsoil	
0.05	0.30	0.25	Stonny Fill	Fill	
0.30	1.50	1.20	Sandy Brown Clay	Sandy Clay	
1.50	2.00	0.50	Basalt and Siltstone Boulders	Basalt	
2.00	4.20	2.20	Siltstone	Siltstone	
4.20	18.00	13.80	Hard Basalt (2mm x 5mm chips)	Basalt	
18.00	21.00	3.00	Basalt and Limestone Layers Hard (2mm x 5mm chips)	Basalt	

21.00	39.00	18.00	Limestone hard	Limestone	

Remarks

10/06/2011: Karla Abbs, 10-06-2011: Removed invalid codes from drillers log

***** End of GW303133 *****

WaterNSW
Work Summary

GW303163

Licence: 30WA317938
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 03/10/2001
Final Depth: 16.00 m
Drilled Depth: 16.00 m

Contractor Name: Country to Coast Drilling
Driller: Leon Frederick Hook
Assistant Driller:

Property: " HAMER'S " 2/7 Denham St PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 14 DP 253436
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 14//253436

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522788.000
Easting: 489559.000
Latitude: 31°25'46.3"S
Longitude: 152°53'24.5"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	16.00	195			Rotary Air
1		Annulus	(Unknown)	1.50	16.00				Graded, Q:0.200m3
1	1	Casing	Pvc Class 18	-0.03	7.00	110	100		Glued
1	1	Opening	Slots - Horizontal	7.00	16.00	110		0	PVC Class 18, SL: 100.0mm, A: 3.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
15.00	15.50	0.50	Unknown	4.40		0.63	16.00	01:00:00	420.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.00	4.00	Clay and Sandy Fill	Clay	
4.00	6.00	2.00	Red Clay	Clay	
6.00	15.00	9.00	Orange Clay Moist	Clay	
15.00	15.50	0.50	Water Cut	(Unknown)	
15.50	16.00	0.50	Bed Rock	Bedrock	

Remarks

10/06/2011: Karla Abbs, 10-06-2011: Removed invalid codes from drillers log

***** End of GW303163 *****

WaterNSW
Work Summary

GW303730

Licence: 30WA313042
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type:

Commenced Date:
Completion Date: 29/01/2003
Final Depth: 40.50 m
Drilled Depth: 40.50 m

Contractor Name: LEON FREDERICK HOOK
Driller: Leon Frederick Hook
Assistant Driller:

Property: CADDIS & MARRIS 10a Highfields Cct PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 10.000
Salinity Description:
Yield (L/s): 0.225

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 1 DP 863370
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 180//1197447

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6520028.000
Easting: 488362.000
Latitude: 31°27'15.9"S
Longitude: 152°52'39.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.50	195			Rotary Air
1		Hole	Hole	4.50	40.50	165			Down Hole Hammer
1		Annulus	Waterworn/Rounded	10.00	40.50				Graded, Q:1.000m3
1	1	Casing	Pvc Class 9	0.00	34.50	110	100		Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	34.50	40.50	110		0	Sawn, PVC Class 9, SL: 200.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
28.00	28.30	0.30	Unknown			0.13	28.30		
33.50	33.90	0.40	Unknown	10.00		0.23	33.90	01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	TOP SOIL	Topsoil	
0.10	2.80	2.70	ORANGE DRY CLAY	Clay	
2.80	20.00	17.20	VERY WEATHERED TAN SILT STONE	Siltstone	
20.00	28.00	8.00	HARD BLUE SILT STONE	Siltstone	
28.00	28.30	0.30	WATER CUT	Siltstone	
28.30	33.50	5.20	HARD BLUE SILT STONE	Siltstone	
33.50	33.90	0.40	WATER CUT	Siltstone	
33.90	40.50	6.60	HARD BLUE SILT STONE	Siltstone	

Remarks

04/06/2012: Karla Abbs, 4-Jun-2012: Removed invalid codes from drillers log

***** End of GW303730 *****

WaterNSW
Work Summary

GW303773

Licence: 30WA313017
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 04/12/2002
Final Depth: 28.20 m
Drilled Depth: 28.20 m

Contractor Name: LEON FREDERICK HOOK
Driller: Leon Frederick Hook
Assistant Driller:

Property: BAKER'S 21 Fernhill Rd PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m): 20.000
Salinity Description:
Yield (L/s): 0.055

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 10 DP 22005
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 10//22005

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521106.000
Easting: 488976.000
Latitude: 31°26'41.0"S
Longitude: 152°53'02.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	9.00	195			Rotary Air
1		Hole	Hole	9.00	28.20	165			Down Hole Hammer
1	1	Casing	Pvc Class 9	0.00	16.20	140	126		Seated on Bottom, Glued
1	1	Opening	Slots - Vertical	16.20	28.20	140		0	Sawn, PVC Class 9, SL: 200.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
20.00	20.40	0.40	Unknown	20.00		0.06	20.40	01:00:00	335.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	TOP SOIL	Topsoil	
0.20	3.00	2.80	RED CLAY	Clay	
3.00	9.00	6.00	ORANGE MOIST CLAY	Invalid Code	
9.00	10.00	1.00	FRACTURED BASALT	Invalid Code	
10.00	20.00	10.00	HARD BASALT	Invalid Code	
20.00	20.40	0.40	WATER CUT	Invalid Code	
20.40	28.20	7.80	HARD BASALT	Invalid Code	

***** End of GW303773 *****

WaterNSW
Work Summary

GW304587

Licence: 30WA313383
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 05/02/2004
Final Depth: 9.10 m
Drilled Depth:

Contractor Name:
Driller:
Assistant Driller:

Property: HENNESSY'S 3/9 Woodgrove Cl PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description: Other
Yield (L/s): 0.385

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	LT 3 DP 71403
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 3//71403

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521495.000
Easting: 489159.000
Latitude: 31°26'28.3"S
Longitude: 152°53'09.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	9.10	10			(Unknown)
1	1	Casing	Other	0.00	9.10	10			

Remarks

05/02/2004: Form A Remarks:
BORE WAS IN WHEN CURRENT OWNERS PURCHASED, NO OTHER DETAILS KNOWN.
DATE USED IS WHEN FORM AG WAS COMPLETED.

***** End of GW304587 *****

WaterNSW
Work Summary

GW305551

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: New Bore
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 01/12/2002
Final Depth: 6.00 m
Drilled Depth:

Contractor Name: (None)
Driller: Unknown Unknown
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	19//1008192
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522324.000
Easting: 488701.000
Latitude: 31°26'01.4"S
Longitude: 152°52'52.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

*** End of GW305551 ***

WaterNSW
Work Summary

GW305580

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: New Bore
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 30/12/2002
Final Depth: 12.00 m
Drilled Depth:

Contractor Name: (None)
Driller: Unknown Unknown
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s): 0.500

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	48//246284
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6523197.000
Easting: 489026.000
Latitude: 31°25'33.0"S
Longitude: 152°53'04.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

*** End of GW305580 ***

WaterNSW
Work Summary

GW305584

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: New Bore
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 01/11/2002
Final Depth: 8.00 m
Drilled Depth:

Contractor Name: (None)
Driller: Unknown Unknown
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 5.000
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	10//1001888
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522393.000
Easting: 488740.000
Latitude: 31°25'59.1"S
Longitude: 152°52'53.5"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

*** End of GW305584 ***

WaterNSW
Work Summary

GW305593

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: New Bore
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 01/11/2002
Final Depth: 9.00 m
Drilled Depth:

Contractor Name: (None)
Driller: Unknown Unknown
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 5.500
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	11//1001888
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522384.000
Easting: 488722.000
Latitude: 31°25'59.4"S
Longitude: 152°52'52.8"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

*** End of GW305593 ***

WaterNSW
Work Summary

GW305712

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: New Bore
Construct.Method: Jetted - Water
Owner Type: Private

Commenced Date:
Completion Date: 11/04/2006
Final Depth: 7.00 m
Drilled Depth:

Contractor Name: SELF DRILLED
Driller: Unknown Unknown
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	37//259471
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522927.000
Easting: 489579.000
Latitude: 31°25'41.8"S
Longitude: 152°53'25.3"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	7.00	100			Jetted - Water

*** End of GW305712 ***

WaterNSW
Work Summary

GW305726

Licence: 30WA313230
Licence Status: CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status: New Bore
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 21/04/2006
Final Depth: 15.00 m
Drilled Depth:

Contractor Name: (None)
Driller: Unknown Unknown
Assistant Driller:

Property: LEECH'S 137 Lake Rd PORT MACQUARIE 2444 NSW
GWMA: -
GW Zone: -
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	1//22596
Licensed:	MACQUARIE	MACQUARIE	Whole Lot 1//22596

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6521088.000
Easting: 490873.000
Latitude: 31°26'41.6"S
Longitude: 152°54'14.2"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpre

***** End of GW305726 *****

WaterNSW
Work Summary

GW306718

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status:
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 02/12/2010
Final Depth: 7.00 m
Drilled Depth:

Contractor Name: (None)
Driller: Unkown Unknown
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	20//1008192
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522343.000
Easting: 488727.000
Latitude: 31°26'00.8"S
Longitude: 152°52'53.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

*** End of GW306718 ***

WaterNSW
Work Summary

GW307179

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DEWATERING (GROU

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Jetted - Water
Owner Type: Private

Commenced Date:
Completion Date: 03/10/2012
Final Depth: 6.50 m
Drilled Depth: 6.50 m

Contractor Name: PUMP AFFINITY
Driller: Gilbert Milton
Assistant Driller: Alex Kinsey

Property:
GWMA:
GW Zone:
Standing Water Level (m): 1.500
Salinity Description:
Yield (L/s): 0.800

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	25//1123026
Licensed:			

Region: 30 - North Coast
River Basin: 207 - HASTINGS RIVER
Area/District:
CMA Map: 9435-2S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522604.000
Easting: 487502.000
Latitude: 31°25'52.2"S
Longitude: 152°52'06.6"E

GS Map: -
MGA Zone: 56
Coordinate Source: GPS - Global

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	6.80	150			Jetted - Water
1	1	Casing	Pvc Class 9	0.00	6.00	60	54		Seated on Bottom, Glued
1	1	Opening	Slots - Horizontal	6.00	6.50	60		0	Mechanically Slotted, PVC Class 9, Glued, SL: 800.0mm, A: 50.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.00	6.80	4.80	Unknown	1.50	2.00	0.80		00:01:00	

Remarks

03/10/2012: Form A Remarks:
Nat Carling, 11-Nov-2013; GPS provided by the drillers.

***** End of GW307179 *****

WaterNSW
Work Summary

GW307506

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: Supply Obtained
Construct.Method: Auger - Hollow
Owner Type: Private

Commenced Date:
Completion Date: 15/03/2014
Final Depth: 7.20 m
Drilled Depth: 7.20 m

Contractor Name: PUCKERIDGE & CO
Driller: Glenn Puckeridge
Assistant Driller: Di Dury

Property:
GWMA:
GW Zone:
Standing Water Level (m): 2.000
Salinity Description:
Yield (L/s): 0.200

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MACQUARIE	MACQUARIE	8//1001888
Licensed:			

Region: 30 - North Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6522400.000
Easting: 488775.000
Latitude: 31°25'58.9"S
Longitude: 152°52'54.8"E

GS Map: -
MGA Zone: 56
Coordinate Source: GIS - Geogra

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.00	170			Auger - Hollow Flight
1		Hole	Hole	4.00	7.20	120			Auger - Hollow Flight
1		Annulus	Bentonite/Grout	0.00	2.00	170	150		
1		Annulus	Waterworn/Rounded	2.00	7.20	120	80		Graded
1	1	Casing	Pvc Class 9	0.00	7.20	80	70		Seated on Bottom, Glued
1	1	Casing	Pvc Class 9	0.00	4.00	150	140		Glued
1	1	Opening	Slots - Vertical	5.00	7.00	80		0	Casing - Hand Sawn Slot, PVC Class 9, Glued, SL: 100.0mm, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
2.00	3.00	1.00	Unknown			0.10			

5.00	7.00	2.00	Unknown	2.00		0.10		01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	Sand; fine	Sand	
2.00	3.00	1.00	Sand; very fine	Sand	
3.00	4.00	1.00	Clay	Clay	
4.00	7.00	3.00	Clay, & coffee rock	Clay	
7.00	7.20	0.20	Clay	Clay	

Remarks

15/03/2014: Form A Remarks:
Nat Carling, 23-Oct-2014; Coordinates based on location map provided with the Form-A.

***** End of GW307506 *****

Appendix D

Historical aerials

Segment 1, 3 & 4 – 1956
Thrumster WWTP
Source: NSW Historical Imagery

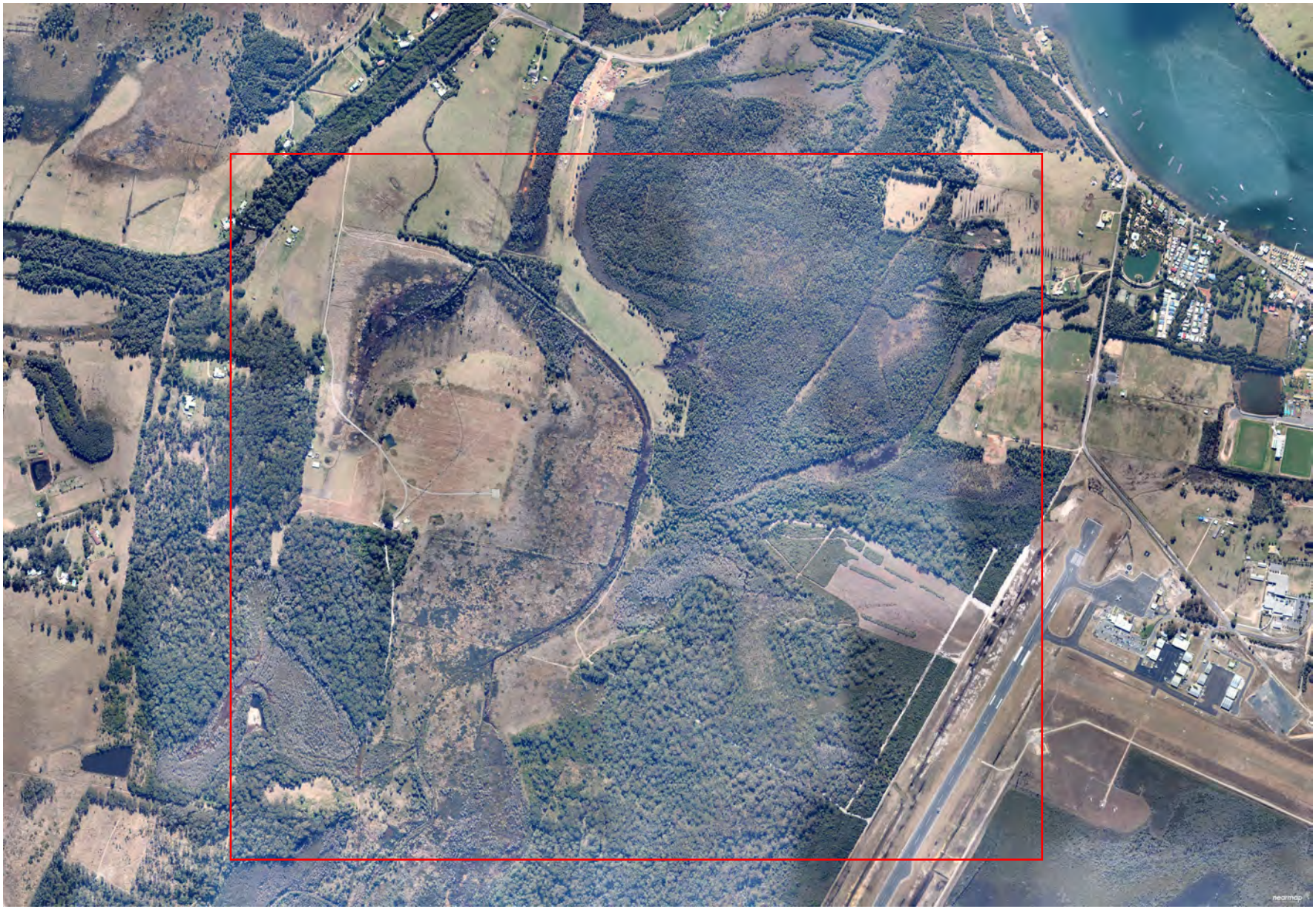
Segment 1, 3 & 4– 1968
Thrumster WWTP
Source: NSW Historical Imagery

Segment 1, 3 and 4– 1979
Thrumster WWTP
Source: NSW Historical Imagery

Segment 1, 3 and 4– 1989
Thrumster WWTP
Source: NSW Historical Imagery

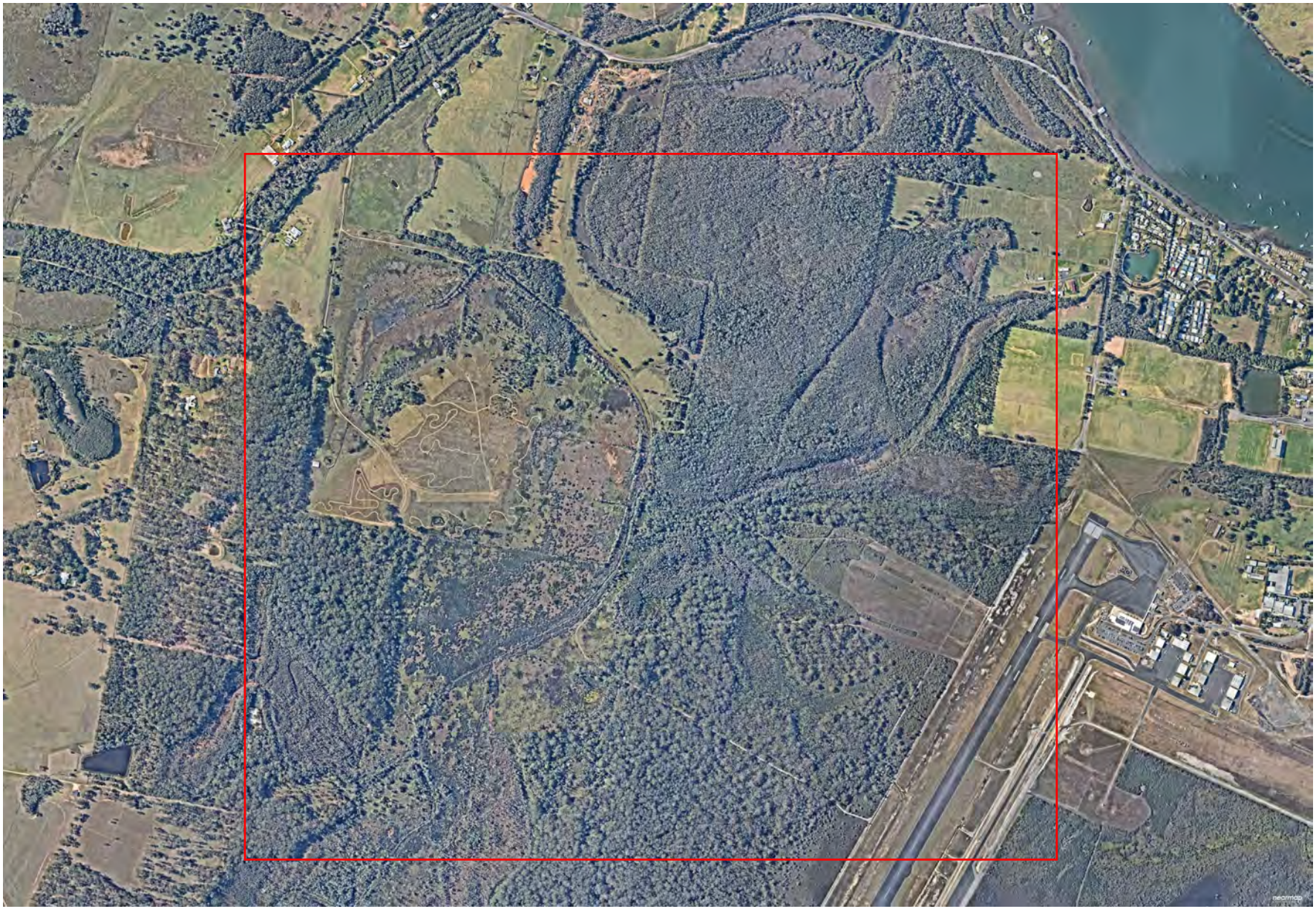
Segment 1, 3 and 4– 1991
Thrumster WWTP
Source: NSW Historical Imagery

Segment 1, 3 and 4– 2010
Thrumster WWTP
Source: Nearmaps



Segment 1, 3 and 4– 2019
Thrumster WWTP
Source: Nearmaps

Segment 1, 3 and 4– 2023
Thrumster WWTP
Source: Nearmaps



Segment 2 – 1956
Thrumster WWTP
Source: NSW Historical Imagery

Segment 2– 1968
Thrumster WWTP
Source: NSW Historical Imagery

Segment 2 – 1979
Thrumster WWTP
Source: NSW Historical Imagery

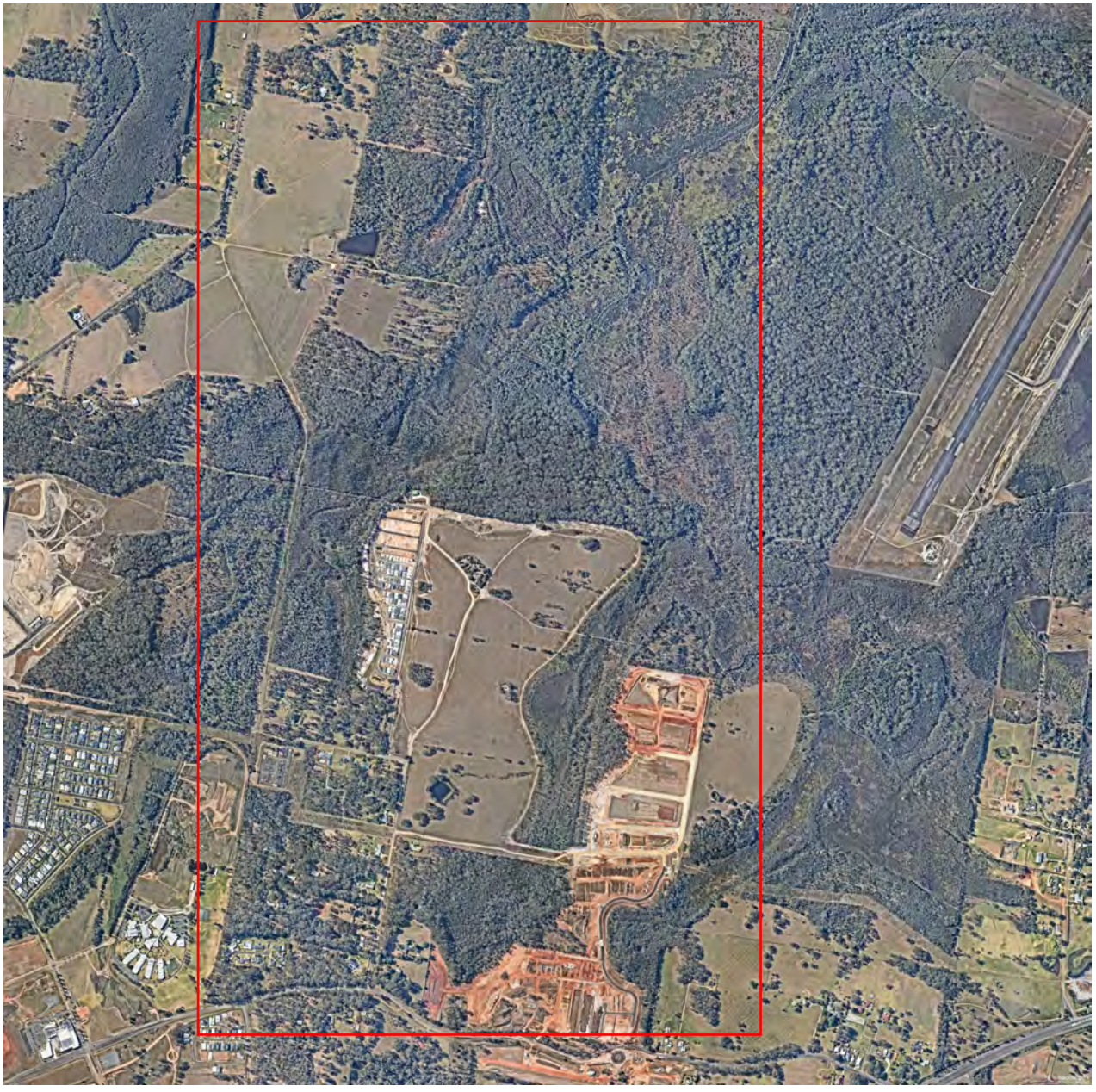
Segment 2 – 1989
Thrumster WWTP
Source: NSW Historical Imagery

Segment 2 – 1991
Thrumster WWTP
Source: NSW Historical Imagery

Segment 2 – 2010
Thrumster WWTP
Source: Nearmaps

Segment 2 – 2019
Thrumster WWTP
Source: Nearmaps

Segment 2 – 2023
Thrumster WWTP
Source: Nearmaps



Segment 5– 1956
Thrumster WWTP
Source: NSW Historical Imagery

Segment 5 – 1968
Thrumster WWTP
Source: NSW Historical Imagery

Segment 5 – 1979
Thrumster WWTP
Source: NSW Historical Imagery

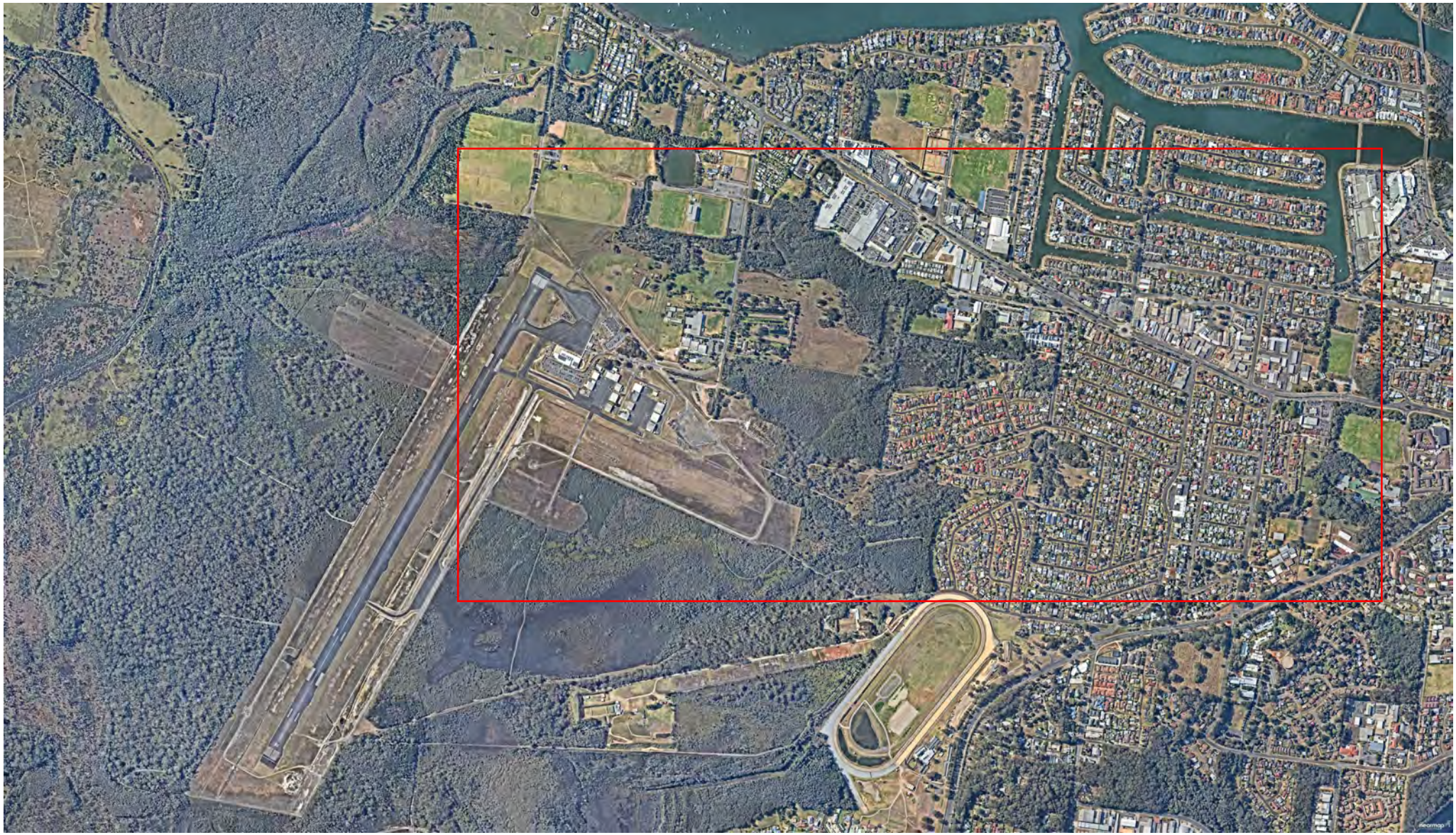
Segment 5 – 1989
Thrumster WWTP
Source: NSW Historical Imagery

Segment 5 – 1991
Thrumster WWTP
Source: NSW Historical Imagery

Segment 5 – 2010
Thrumster WWTP
Source: Nearmaps

Segment 5 – 2019
Thrumster WWTP
Source: Nearmaps

Segment 5 – 2023
Thrumster WWTP
Source: Nearmaps



Segment 6 & 7– 1956
Thrumster WWTP
Source: NSW Historical Imagery

Segment 6 and 7 – 1968
Thrumster WWTP
Source: NSW Historical Imagery

Segments 6 and 7 – 1979
Thrumster WWTP
Source: NSW Historical Imagery

Segments 6 and 7 – 1989
Thrumster WWTP
Source: NSW Historical Imagery

Segments 6 and 7 – 1991
Thrumster WWTP
Source: NSW Historical Imagery

Segments 6 and 7 – 2010
Thrumster WWTP
Source: Nearmaps

Segments 6 and 7 – 2019
Thrumster WWTP
Source: Nearmaps

Segments 6 and 7 – 2023
Thrumster WWTP
Source: Nearmaps

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