Appendix 4.1.1A. Drinking Water Infrastructure

Appendix 4.1.1(a) Description of Proposed Drinking Water Infrastructure

Drinking Water Infrastructure	Description
Bulk Water Supply Connection Point	The bulk water supply for the Cobaki scheme is drinking water sourced from Tweed Shire Council (TSC) under a bulk drinking water supply agreement. A bulk drinking water connection point will be provided by TSC Located in Piggabeen Road. Connection to the existing 375mm main will be by Leda Manorstead (LM). The new 375mm rising main will run along Piggabeen Road and will be directional bored under Cobaki Creek and terminate with a valve meter assembly at the Cobaki Parkway and Sandy Road roundabout. On completion of the works and sign off by TSC the works will be gifted to TSC to own and operate. Refer to Appendix 4.1.3 for a plan showing from the connection point to the meter assembly outlet. Communication protocols will be put in place with the TSC to ensure any water quality issues are communicated to NWS in a timely manner.
Drinking Water Transfer Rising Main	The drinking water transfer rising main (DWTRM) will be connected to the valve outlet of the meter assembly located at the Cobaki Parkway & Sandy Road roundabout and installed in easements that run through precinct 10 to the Waste Water Treatment Plant (WWTP) boundary by LM. Upon completion and hand over of the works the works will be gifted to NWS to own and operate. Refer to the Water Balance Report in Appendix 4.1.6(a), Appendix B for detailed drawing of the DWTRM. The DWTRM will transfer the 1.709MLD of drinking water to the WWTP site at a flow rate of 19.78l/s.
Onsite Drinking Water Storage Tanks	The Total Drinking water storage will be 8ML. The tank storage will be as the development is built out. Stage-A 2ML Stage-C 4ML Stage-D 2ML The 8ML tank will provide approximately 3- days storage at peak day potable water demands and includes 0.5ML dedicate emergency fire storage. The tanks will be a steel panel tank with internal polymer lining suitable for contact with drinking water. Each 2ML storage tank will have its 300mm psychical air gap for back flow protection. Each tank inlet will have its own motorized valve for isolation and maintenance purposes along with its own individual level sensor. Each tank will have its own overflow and drain valves which will be connected to the WWTP storm water network.
Chlorine Monitoring and Dosing System	The drinking water storage tanks will include a recirculation loop with continuous online Monitoring the system for maintenance of the chlorine residual levels in the storages.

	The chlorine monitoring and dosing system will be controlled through the SCADA CMS system. Alarms will be activated for high and low free chlorine concentrations. The Chlorine dosing pumps will inject chlorine into the downstream side of the Variable speed pump sets and up stream of the inline water mixer when the residual chlorine level falls below the required set point.
The Drinking Water Supply Variable Speed Pump Stations	The drinking water pressure and flow in the Cobaki Estate scheme networks will be controlled by the variable speed pump stations installed in stages A & C. Each pump station will have a jacking pump to maintain the pressure and flow at off peak times especially during the night and early mornings. The pump sets will use a series of multiple pumps controlled by variable speed drives to maintain the pressure and flow set point in the downstream reticulation system across a wide range of flows. Pressure set point of the drinking water pumps will be maintained a minimum of 50 KPA higher than in the recycled water supply networks to help avoid any cross contamination. The drinking water pump stations are connected to the emergency generator back up power supply in the event of a power failure or a shut down by the energy provider for maintenance purposes. The generator is controlled by an auto change over switch located in the Main Switch Board (MSB) located in Stage A MBR room of the WWTP building. The emergency generator will provide power to all essential services during such an event including drinking water and recycled water infrastructure systems.
The Drinking Water Reticulation Network	The drinking water reticulation network will be designed and constructed in accordance with Water Services Association Australia (WSAA) standards, AS 3500 and the Plumbing Code of NSW. The reticulation system will be constructed in line with staging of the residential development. Pressure and flow sustaining valves will be used throughout the networks to maintain flow and pressure at the most furthest points in the networks. The networks will all isolating valves, air vents, flushing points and fire hydrants installed to maintain an efficient drinking water system. The drinking water reticulation mains will use a different color piping material to that used in the recycled water network to reduce the potential for cross connection. The drinking water mains will use blue PVC pipe and blue striped HDPE pipe.
Customer Connection Points	A metered connection point will be provided to each allotment/customer. Each connection point will be provided with a dual check valve for backflow prevention, isolation stop valve and smart water meter. Each customer must apply for a drinking water connection by filling out an online application form from the NWS Cobaki Web site. When NWS receives the correctly filled out application form, fees that apply and a copy of the cross flow connection test report required by the Office of Fair Trading (NWS will work with Council to make sure these certificates are received and recorded), NWS will arrange to have the drinking water meter installed for the customers registered plumber to connect to.

Drinking Water Uses	The drinking water system will supply all drinking water to meet the demands within the Cobaki Estate. Approved drinking water uses include: – Drinking; – All bathroom taps including the shower, bath tub, basins and vanity units; – All kitchen taps including the kitchen sink and dishwasher; – The hot water service supplied to all areas of the house; – The laundry sink; – Pool and spa top- up; – Food preparation; – Cooking purposes; – Fire hydrants and – All other drinking water uses not specifically mentioned above.
Online Monitoring, Control and Alarm System	Continuous online monitoring, control and alarms for the drinking water infrastructure is centrally managed using the SCADA CMS system. The control system allows the infrastructure to operate unattended and automatically and reports all issues requiring operator attention. Online monitoring probes for pressure, flow, Ph and chlorine residual correction are manually calibrated and checked by operations staff on a routine basis to ensure all probes are recording accurate readings. All critical alarm systems have a battery backup to ensure faults are reported even during power outages. The control system is designed to automatically recover to where it was following a power outage.

Appendix 4.1.1B. TSC Letter of Feasibility

Council Reference:
Your Reference:

TWEED SHIRE COUNCIL

25 July 2016

Customer Service | 1300 292 872 | (02) 6670 2400

tsc@tweed.nsw.gov.au
www.tweed.nsw.gov.au

Fax (02) 6670 2429
PO Box 816
Murwillumbah NSW 2484

Please address all communications to the General Manager

ABN: 90 178 732 496

Mr Wayne Williamson
Northern Water Solutions
PO Box 977
NOOSA HEADS QLD 4567

Via email to: wayne@northernwatersolution.com

Dear Wayne

Provision of Water and Sewerage Services to Cobaki

In discussions between Northern Water Solutions (NWS) at Council's Tweed offices on 31 May 2016 NWS sought a letter from Council indicating that it was feasible for Council to provide bulk water and receive treated wastewater from an operator, licensed under the Water Industry Competition Act 2006, of water and sewerage infrastructure at the Cobaki development.

On 21 July 2016 Council resolved to issue a letter to NWS advising NWS that it is technically feasible for Council to provide bulk water and receive treated wastewater from NWS for the Cobaki development, subject to:

1. Determining the impact on Council's infrastructure;
2. Developing an agreement which ensures Council is not disadvantaged; and
3. A further resolution of Council approving the negotiated agreement.

It should be noted that to enable this to occur there is a need for additional Council infrastructure to supply the bulk water and accept the treated wastewater from the development.

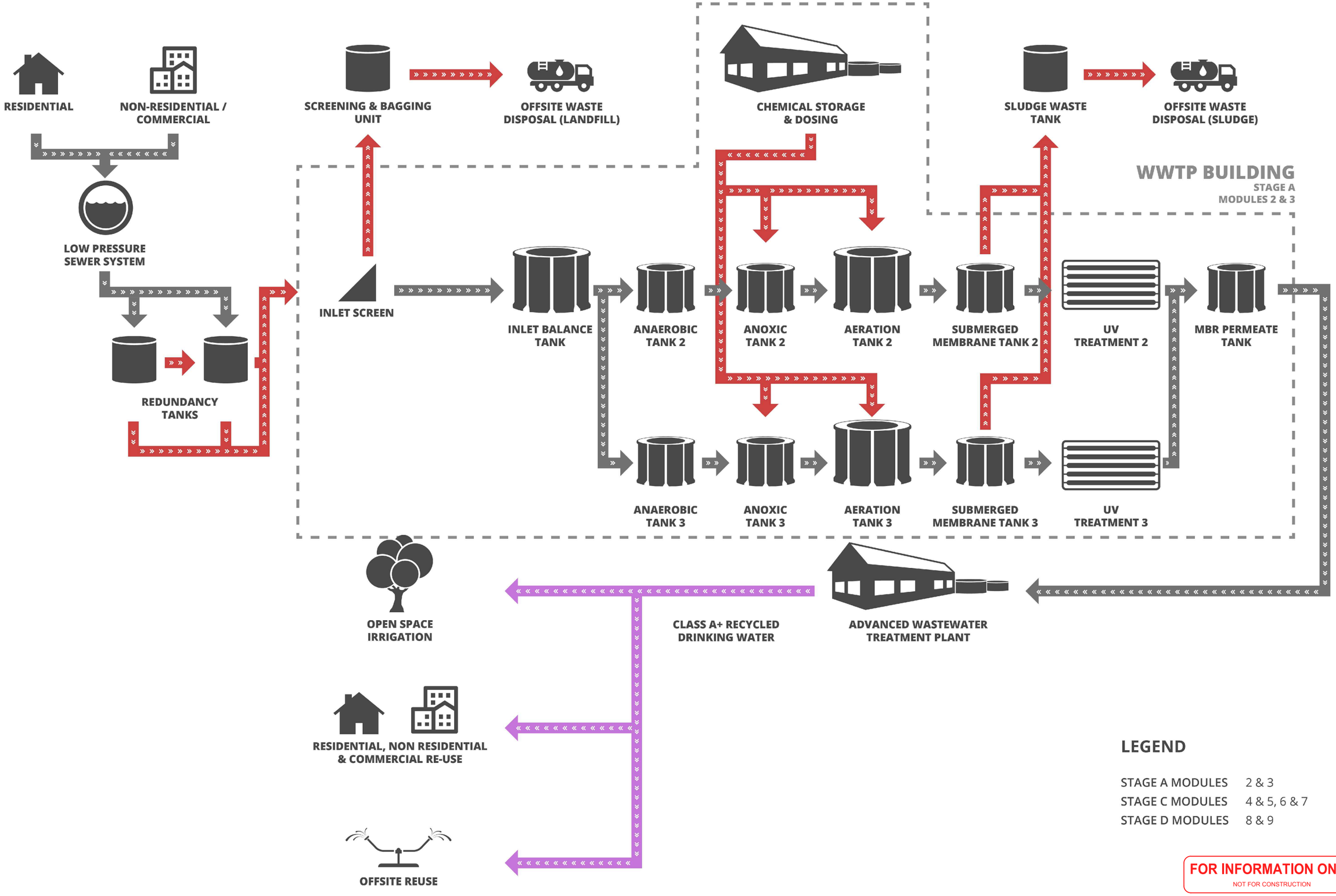
The intent of this letter, as requested by Northern Water Solutions, is to inform the Independent Pricing and Regulatory Tribunal that it is technically feasible for Council to provide bulk water to and receive bulk wastewater from a licenced operator at the Cobaki development. The letter is not a commitment to do so as any such commitment would require a resolution of Council after consideration of a proposed agreement between Northern Water Solutions and Tweed Shire Council.

If you have any enquiries in respect to this matter please contact Rob Siebert at Tweed Shire Council at rsiebert@tweed.nsw.gov.au.

Yours faithfully

David Oxenham
DIRECTOR ENGINEERING

Appendix 4.1.1C. PFD Diagrams



LEGEND

STAGE A MODULES	2 & 3
STAGE C MODULES	4 & 5, 6 & 7
STAGE D MODULES	8 & 9

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A	ISSUED FOR INFORMATION	17-08-2016	CW	WW	AW	-
B	ISSUED FOR INFORMATION	25-08-2016	CW	WW	AW	

SCALES:
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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES
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DATE:
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Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429
www.wgmconsulting.com.au

CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

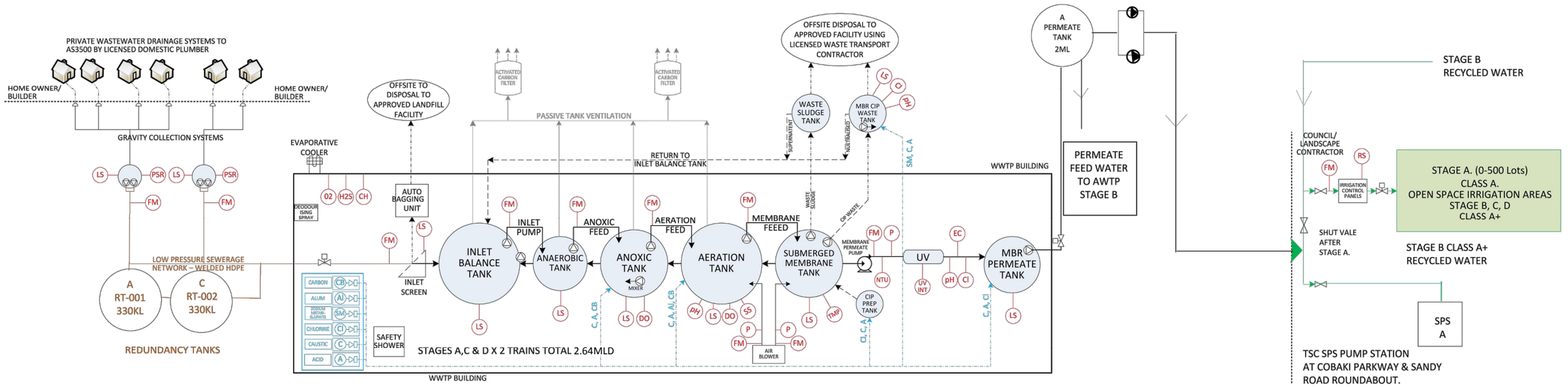
DRAWING TITLE:
WASTE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 1A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0430	C

COBAKI PROCESS FLOW DIAGRAM

STAGE A, C & D MBR WASTEWATER TREATMENT PLANT

Membrane Bioreactor Peak Design Capacity 2.64MLD



LOW PRESSURE SEWERAGE SYSTEM

- WASTEWATER WILL DRAIN THROUGH A GRAVITY SEWERAGE COLLECTION SYSTEMS TO A NUMBER OF DUPLEX LOW PRESSURE SEWAGE PUMP STATIONS THAT SERVICE 1 TO 4 LOTS EACH.
- WASTEWATER IS PUMPED IN A CONTROLLED MANNER THROUGH THE LOW PRESSURE SEWERAGE NETWORK TO THE REDUNDACY TANK AT THE WWTP. OPERATION OF THE PRESSURE SEWER NETWORK PUMPS IS CONTROLLED BY THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP TO CONTROL PEAK INFLOWS TO THE MBR.
- LOW PRESSURE SEWER NETWORK TO BE CONSTRUCTED WITH BROWN-STRIPED PN 16 HDPE PIPE WITH WELDED PIPE JOINTS AND FITTINGS.
- EACH LOW PRESSURE SEWERAGE PUMP STATION WILL INCLUDE:
  - PUMP HEAD AND FLOW CAPACITY TO SERVICE BETWEEN 1 AND 4 LOTS.
  - DUTY AND STANDBY PUMPS WITH ONLINE FAULT DETECTION AND ALARMS.
  - 24 HOURS EMERGENCY STORAGE CAPACITY IN THE WET WELL.
  - HARD WIRED COMMUNICATION CABLING BACK TO THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP.
  - CONTINUOUS ONLINE WET WELL WATER LEVEL AND FLOW MONITORING WITH ALARMS.
  - AUTOMATED SYSTEM START-UP AND RECOVERY FOLLOWING POWER OUTAGE VIA THE DIRECT DIGITAL CONTROL SYSTEM.
  - ADDITIONAL ONLINE WATER QUALITY MONITORING PROBES, E.G. PH, TDS, NTU, FOR DETECTION OF INAPPROPRIATE CHEMICAL DISPOSAL OR TRADE WASTE PRACTICES, DURING OPERATION.

STAGE A,C,& D WASTEWATER TREATMENT PLANT – MEMBRANE BIOREACTOR

- ALL WASTEWATER TREATED IN THE MEMBRANE BIOREACTOR TO PRODUCE "CLASS A" RECYCLED WATER SUITABLE FOR CONTROLLED IRRIGATION . MBR TARGET EFFLUENT QUALITY:
  - BIOCHEMICAL OXYGEN DEMAND < 10 mg/L
  - SUSPENDED SOLIDS < 10 mg/L
  - TOTAL NITROGEN < 10 mg/L
  - TOTAL PHOSPHOROUS < 0.3 mg/L
  - pH 6.5 TO 8.5
  - FAECAL COLIFORMS < 10 cfu/100 mL
- PEAK DESIGN CAPACITY OF MBR PROCESS TRAIN IS 600kL PER MODULE X4

THE ADVANCED WATER TREATMENT PLANT TO PRODUCE "CLASS A+ RECYCLED WATER" WILL BE OPERATIONAL ONCE 500 LOTS ARE CONNECTED TO THE SYSTEM IN STAGE B.

- OPERATION OF THE WWTP IS FULLY AUTOMATED AND INTEGRATED WITH OPERATION OF THE PRESSURE SEWER NETWORK TO CONTROL PEAK FLOWS INTO THE MBR USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ALL ON LINE MONITORING, CONTROL AND ALAM SYSTEM CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR LATER REVIEW AND TROUBLE SHOOTING.

STAGE A EFFLUENT MANAGEMENT SYSTEM

- AN IRRIGATION MANAGEMENT PLAN AND RECYCLED WATER MANAGEMENT PLAN WILL BE DEVELOPED FOR THE SCHEME THAT WILL OUTLINE SITE SPECIFIC IRRIGATION, ENVIRONMENTAL AND PUBLIC HEALTH CONTROL MEASURES FOR EACH IRRIGATION AREA. TYPICAL IRRIGATION CONTROLS WILL INCLUDE:
  - IRRIGATION CONTROLLERS TO CONTROL THE TIME, FREQUENCY AND DURATION OF IRRIGATION EVENTS.
  - RAIN-SENSOR OVERRIDE ON IRRIGATION CONTROLLERS AND IRRIGATION SUPPLY PUMP TO PREVENT IRRIGATION DURING OR SHORTLY AFTER RAIN.
  - SUBSURFACE IRRIGATION IN WITHIN 20 METRES OF IDENTIFIED SENSITIVE RECEPTORS.
  - SPRAY DRIFT CONTROLS ON SURFACE IRRIGATION SYSTEMS.
  - APPROPRIATE BUFFER DISTANCES TO WATERWAYS, SEPP 14 WETLANDS AND OTHER SENSITIVE RECEPTORS.
  - CROSS CONNECTION CONTROLS INCLUDING UNIQUE PIPE MATERIALS, BACKFLOW PREVENTION AND PRESSURE MANAGEMENT.
  - IRRIGATION AT NIGHT TO MINIMISE POTENTIAL FOR HUMAN CONTACT.
  - APPROPRIATE WARNING SIGNS AND IDENTIFICATION AND LABELLING.

NOTE:
DURING STAGE A. CLASS A. TREATED EFFLUENT WILL BE USED TO DEVELOP THE 20HA OF OPEN SPACE AND SPORTS FIELDS BY CONTTROLLED IRRIGATION SYSTEM. EXCESS TREATED.
EFFLUCENT DURING WET WEATHER EVENTS WILL BE DISCHARGED TO THE NEW SP5 LOCATED AT COBAKI PARKWAY & SANDY ROAD ROUNDABOUT WHICH IS CONNECTED TO THE EXISTING TSC NETWORK.
STAGE B.
RECYCLED WATER WILL BE USED ONLY ON THE OPEN SPACE & SPORTS FIELD AREA'S AND ANY EXCESS ? WILL BE DISCHARGED TO THE TSC SPS.
REFER TO THE WATER BALANCE REPORT FOR MORE DETAILS .

LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- PSR PUMP STARTS AND RUN HOURS
- LS WATER LEVEL
- DO DISSOLVED OXYGEN
- SS MIXED LIQUOR SUSPENDED SOLIDS
- pH pH
- Cl FREE CHLORINE RESIDUAL
- NTU TURBIDITY
- TMP TRANSMEMBRANE PRESSURE
- UV INT UV INTENSITY
- EC ELECTRICAL CONDUCTIVITY
- RS RAIN SENSOR
- CH METHANE GAS
- H2S HYDROGEN SULPHIDE GAS
- 02 OXYGEN GAS

PROCESS EQUIPMENT

- INLET SCREEN
- MEMBRANE BIOREACTOR PROCESS TANKS
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- HOUSEHOLD SEWERAGE CONNECTION POINT
- EVAPORATIVE AIR CONDITIONING UNIT

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- CB ACETIC ACID (CARBON) DOSING AS SUPPLEMENTARY FOOD SOURCE
- Al POLYALUMINIUM CHLORIDE DOSING FOR PHOSPHORUS REMOVAL
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

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Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429
www.wgmconsulting.com.au
CONSULTING

CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

DRAWING TITLE:
WASTE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 1B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
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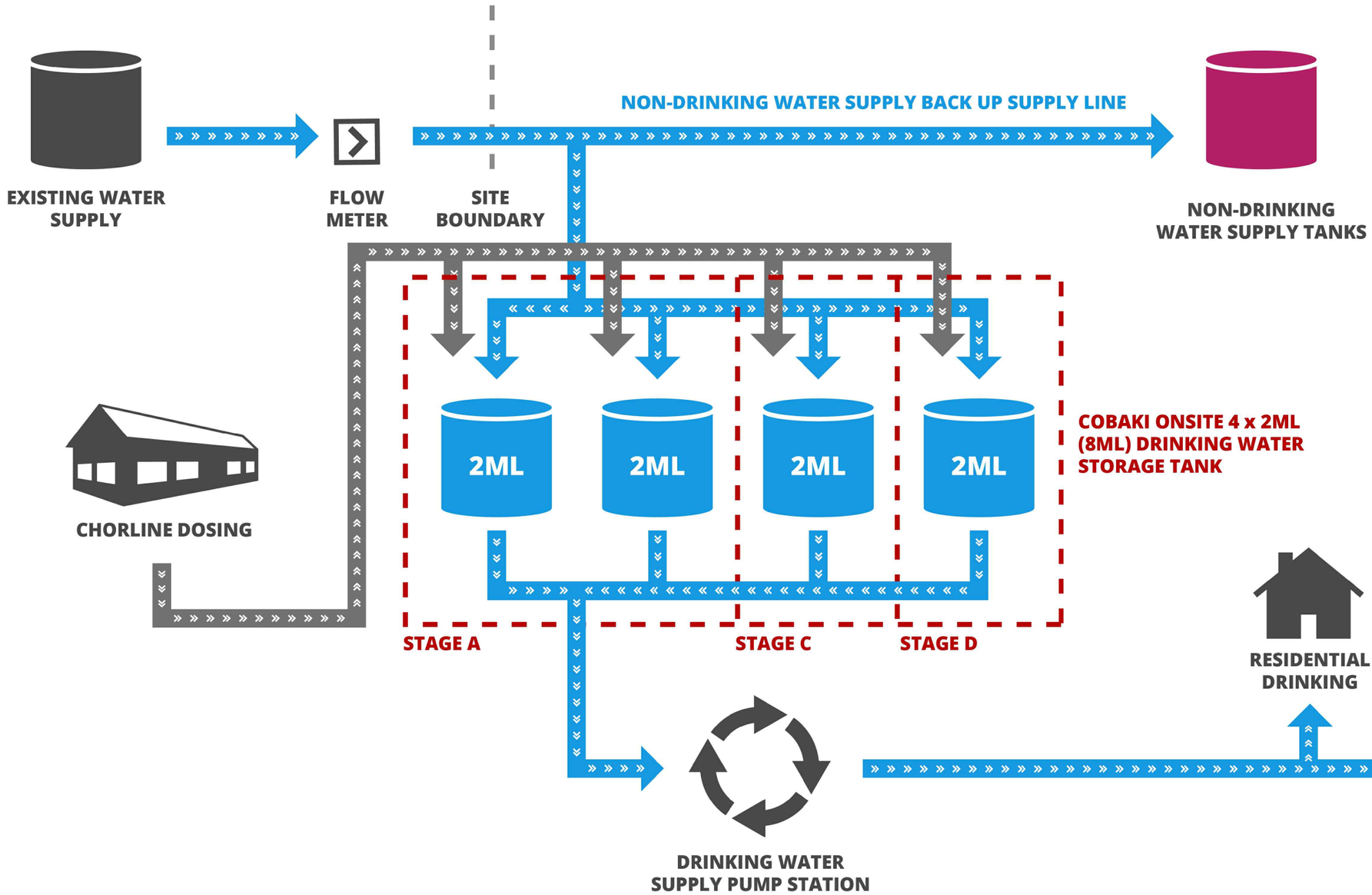

TOTAL 8ML

STAGE A - 2 x 2ML
STAGE C - 1 x 2ML
STAGE D - 1 x 2ML

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PROJECT:
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PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

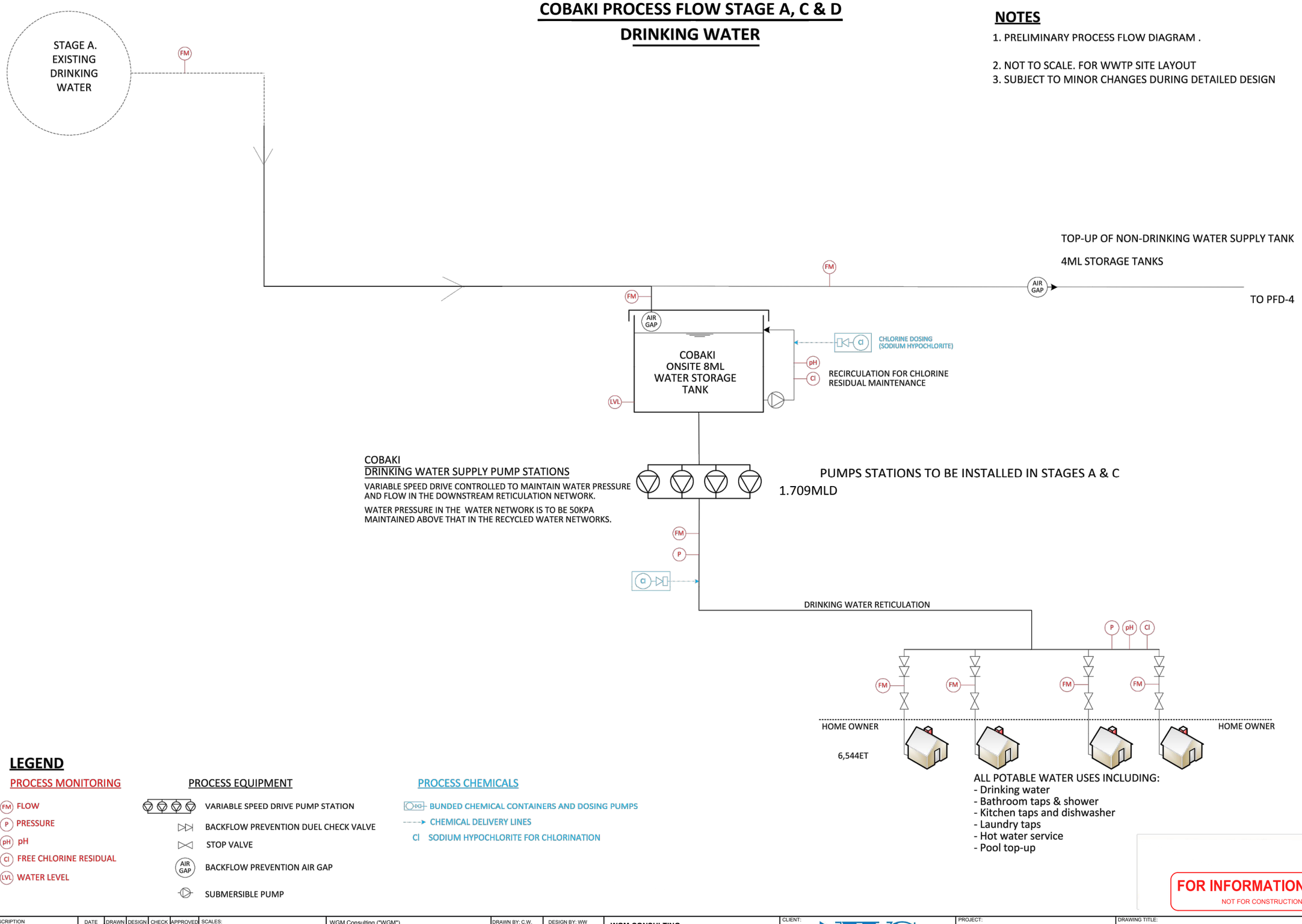
DRAWING TITLE:
DRINKING WATER
PROCESS FLOW DIAGRAM 2A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0432	C

COBAKI PROCESS FLOW STAGE A, C & D
DRINKING WATER

NOTES

1. PRELIMINARY PROCESS FLOW DIAGRAM .
2. NOT TO SCALE. FOR WWTP SITE LAYOUT
3. SUBJECT TO MINOR CHANGES DURING DETAILED DESIGN



LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- pH pH
- Cl FREE CHLORINE RESIDUAL
- LVL WATER LEVEL

PROCESS EQUIPMENT

- VARIABLE SPEED DRIVE PUMP STATION
- BACKFLOW PREVENTION DUEL CHECK VALVE
- STOP VALVE
- AIR GAP BACKFLOW PREVENTION AIR GAP
- SUBMERSIBLE PUMP

PROCESS CHEMICALS

- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION

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DRAWING TITLE:
DRINKING WATER
PROCESS FLOW DIAGRAM 2B

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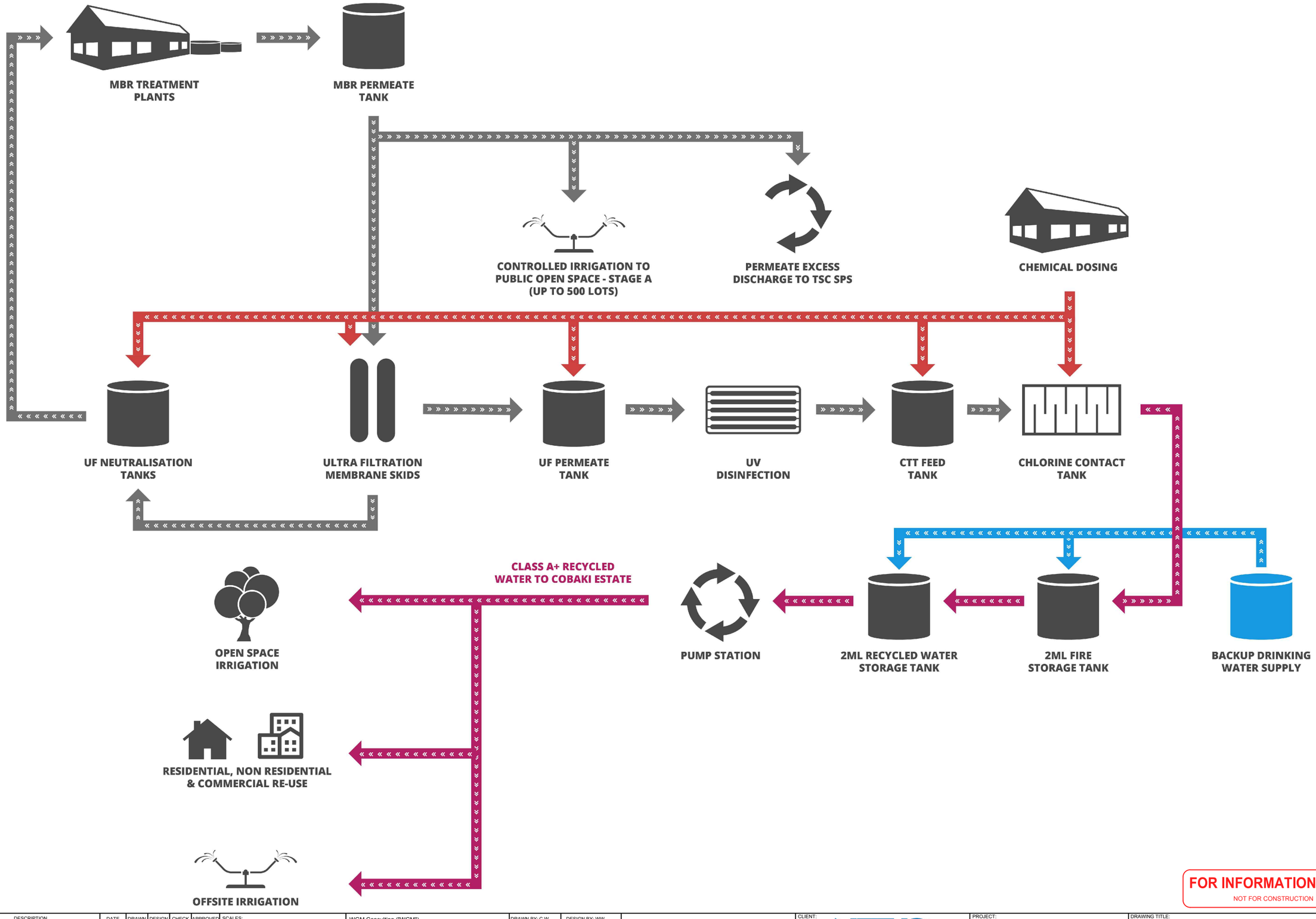

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Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429

www.wgmconsulting.com.au

CLIENT:

NORTHERN WATER SOLUTIONS

PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:

COBAKI ESTATE
PIGGABEEN ROAD
NSW

TWEED SHIRE COUNCIL

DRAWING TITLE:

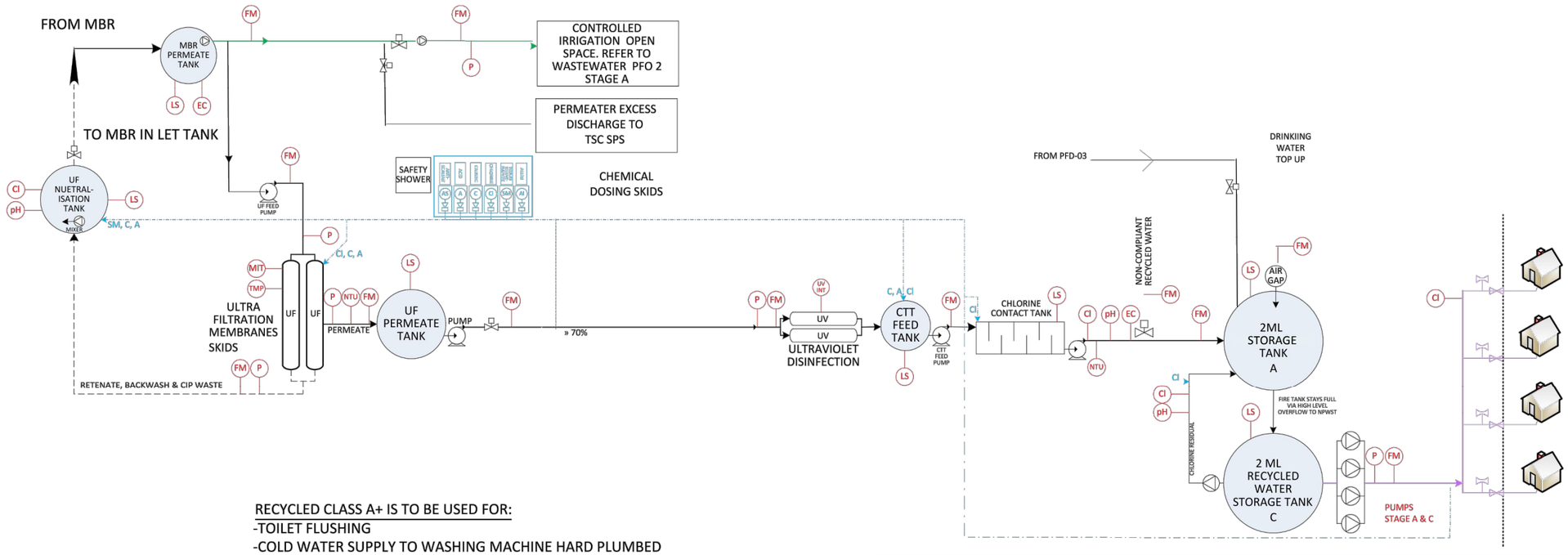
ADVANCED WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 3A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0434	C

COBAKI PROCESS FLOW DIAGRAM

STAGE B ADVANCED WATER TREATMENT PLANT

CLASS A+ RECYCLED WATER



RECYCLED CLASS A+ IS TO BE USED FOR:
-TOILET FLUSHING
-COLD WATER SUPPLY TO WASHING MACHINE HARD PLUMBED
-HOME & INDUSTRIAL WASHDOWN
-CAR WASHING
-GARDEN & LAWN WATERING
-WATER FEATURES
-OPEN SPACE AREA'S & SPORTS FIELD , GOLF COURSE
-COMMERCIAL USES NURSRIES ETC
-INDUSTRIAL COOLING TOWERS CONCRETE PRODUCTION, DUST SUSPRESSION FOR CONSTRUCTION SITES & ROAD BUILDING.

LEGEND

PROCESS MONITORING

- FM FLOW METRE
- P PRESSURE
- LS WATER LEVEL
- EC ELECTRICAL CONDUCTIVITY
- TMP TRANSMEMBRANE PRESSURE
- MIT MEMBRANE INTEGRITY TEST
- NTU TURBIDITY
- UV INT UV INTENSITY
- pH pH
- CI FREE CHLORINE RESIDUAL

PROCESS EQUIPMENT

- ADVANCED WATER TREATMENT PLANT PROCESS TANKS
- ULTRAFILTRATION MEMBRANE SKID
  NOMINAL MEMBRANE PORE SIZE 0.03 UM
  INTEGRITY TESTING BY PRESSURE DECAY
  USEPA ACCREDITED MEMBRANES SUPPLIED BY X-FLOW
- ULTRAVIOLET DISINFECTION SYSTEM
  SELF CLEANING SYSTEM WITH UV INTENSITY MONITORING
  NOMINAL UV DOSE OF 90 J/m2 @ UV TRANSMISSION OF 50%
  USEPA ACCREDITED UV DISINFECTION SYSTEM SUPPLIED BY ORICA
- CHLORINE CONTACT TANK
  CONTACT TANK WILL BE DESIGNED TO USEPA GUIDELINES TO ACHIEVE CT VALUES FOR THE REQUIRED LOG REMOVAL TARGETS.
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- MANUAL VALVE
- EVAPORATION MISTING SPRAYERS

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- AS REVERSE OSMOSIS MEMBRANE ANTISCALENT
- CI SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

STAGE B WWTP – ADVANCED WATER TREATMENT PLANT

- THE ADVANCED WATER TREATMENT PLANT (AWTP) WILL BE COMMISSIONED ONCE 500 LOTS HAVE BEEN CONNECTED TO THE SYSTEM.
- THE AWTP IS SIZED TO PRODUCE 2.4 MLDAY OF CLASS A+ RECYCLED WATER SUITABLE FOR SUPPLY IN THE DUAL RETICULATION SYSTEM FOR DOMESTIC RE-USE
- LOG REDUCTION TARGETS FOR THE AWTP BASED ON TABLE 3.7 IN THE NATIONAL GUIDELINES FOR WATER RECYCLING (EPHC: 2006) ARE:
  - BACTERIA: >5.3 LOG REDUCTION
  - VIRUSES: >6.5 LOG REDUCTION
  - PROTOZOAN: >5.1 LOG REDUCTION
- LOG REDUCTION TARGETS WILL BE ACHIEVED USING ULTRAFILTRATION MEMBRANES, ULTRAVIOLET DISINFECTION AND CHLORINE CONTACT TANK. ALL PROCESSES AND EQUIPMENT USED TO ACHIEVE LOG REDUCTION TARGETS WILL BE ACCREDITED TO USEPA GUIDELINES AND VALIDATED ONSITE PRIOR TO COMMENCEMENT OF SUPPLY OF RECYCLED WATER FOR DOMESTIC USE
- PRIOR TO COMMISSIONING AND VALIDATION OF THE AWTP DURING STAGE B DRINKING WATER WILL BE USED TO SUPPLY THE DUAL RETICULATION SYSTEM.
-
- OPERATION OF THE AWTP IS FULLY AUTOMATED AND INTEGRATED WITH THE OPERATION OF THE DUAL RETICULATION SYSTEM USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ALL ONLINE MONITORING, CONTROL AND ALARM SYSTEMS CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR REVIEW AND TROUBLE SHOOTING.
- THE AWTP IS DESIGNED TO AUTOMATICALLY SHUT DOWN IF NON-COMPLIANT RECYCLED WATER IS DETECTED THROUGH CONTINUOUS ONLINE MONITORING.
- THE NON-DRINKING WATER STORAGE TANK PROVIDES IN APPROXIMATELY 3-DAY STORAGE AT PEAK RECYCLED WATER DEMANDS. THE DUAL RETICULATION SYSTEM WILL BE SUPPLEMENTED BY A DRINKING WATER TOP-UP DURING PERIODS OF EXTENDED PEAK DEMAND IF REQUIRED

FOR INFORMATION ONLY
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR INFORMATION	17-08-2016	CW	WW	AW	-
B	ISSUED FOR INFORMATION	25-08-2016	CW	WW	AW	

SCALES:
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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES
DO NOT SCALE FROM DRAWING

DRAWN BY: C.W. | DESIGN BY: WW
APPROVED BY:
DATE:
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WGM CONSULTING
Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429
www.wgmconsulting.com.au
CONSULTING

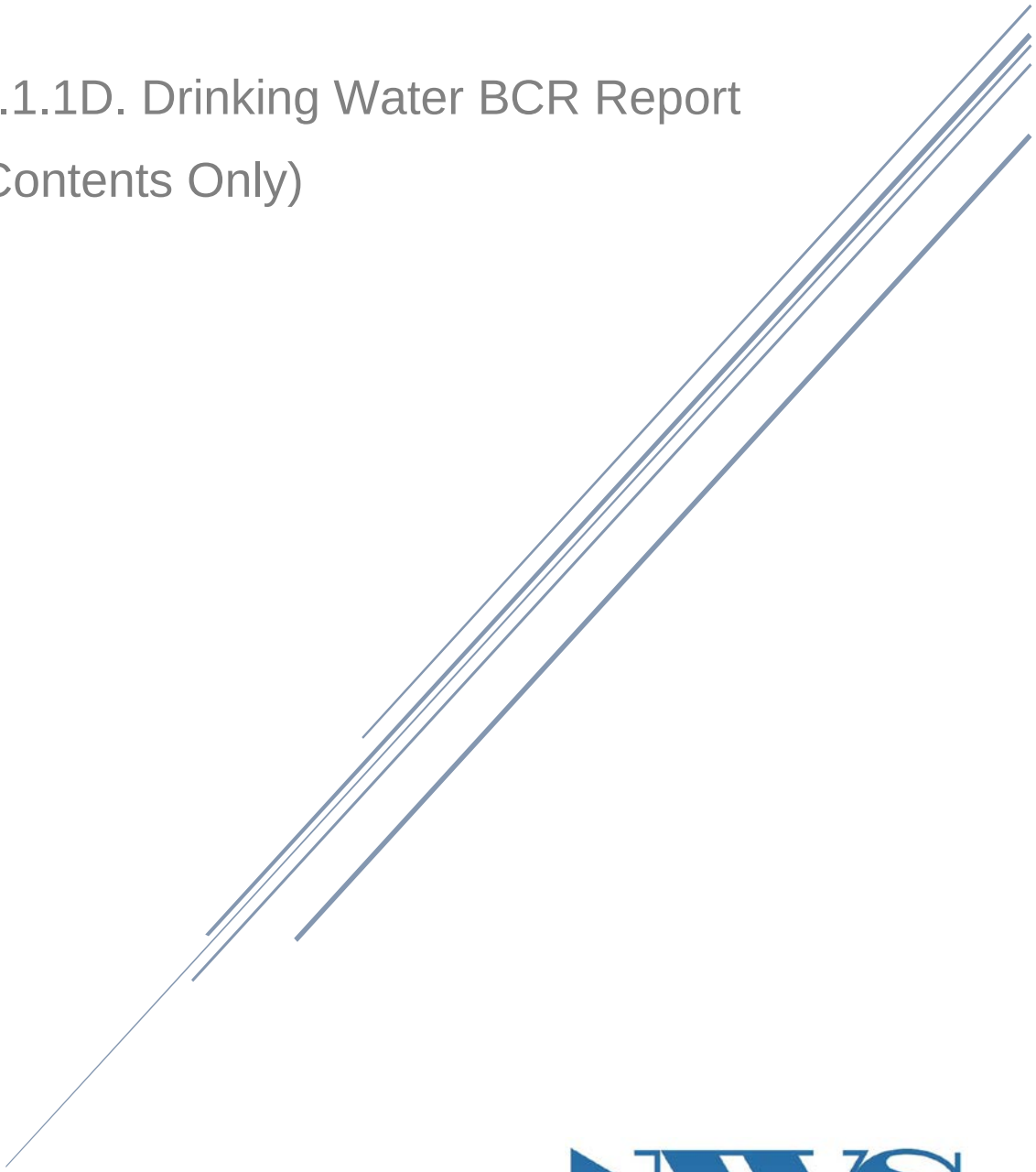
CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

DRAWING TITLE:
ADVANCED WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 3B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0435	C

Appendix 4.1.1D. Drinking Water BCR Report (Table of Contents Only)



Cobaki Estate - Drinking Water Boundary Conditions Report

Northern Water Solutions Pty Ltd

WGM Consulting

Date: September 2016

Document No.: J116 – RPT003 – Rev04

Document Status

Version	Document type	Reviewed by	Checked by	Date Issued
Rev 01	Report	S Robinson	A.Wells	14/07/2016
Rev 02	Report	W Williamson	A Wells	18/07/2016
Rev 03	Report	W Williamson	A Wells	30/08/2016
Rev 04	Report	W Williamson	A Wells	07/09/2016

Project Details

Project Name:	Cobaki Estate – Drinking Water Boundary Conditions Report
Client	Northern Water Solutions Pty Ltd
CEO	Wayne Williamson
Authors	Andrew Wells
WGM Reference:	J116

WGM Consulting
ABN 59 210 741 429
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
wgm@wgmconsulting.com.au

Contents

List of Figures

Appendix 4.1.1E. Drinking Water Master Plan

LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
- SCHOOL / UTILITIES
- OPEN SPACE
- ENVIRONMENTAL PROTECTION AREA
- COVENANT PROTECTED AREA
- STRUCTURED OPEN SPACE
- DAM
- PROPOSED COMMUNITY FACILITIES
- INDICATIVE HIGH LEVEL PRESSURE ZONE
- POTABLE WATER SUPPLY LINE
- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN

DETAIL SHEET 1

DETAIL SHEET 2

DETAIL SHEET 3

DETAIL SHEET 4

DETAIL SHEET 5

QUEENSLAND

NEW SOUTH WALES

N

WWTP SITE

HIGH AND LOW LEVEL DRINKING WATER MAINS OUT OF WWTP

WATER SUPPLY MAIN TO WWTP

INDICATIVE ZONE BOUNDARY VALVES

INDICATIVE ZONE BOUNDARY VALVES

POTENTIAL EMERGENCY OPERATIONAL INTERCONNECTION

PIGGABEEN ROAD

COBAKI CREEK

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR INFORMATION	07-07-16	DH	-	AW	-
B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-

SCALES:

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES

DO NOT SCALE FROM DRAWING

A1 ORIGINAL

DRAWN BY: CW

DESIGN BY: CW

APPROVED BY:

DATE:

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PLANIT ENGINEERING
SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:

NORTHERN WATER SOLUTIONS

PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
DRINKING WATER SCHEME
OVERALL LAYOUT

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0006	B

N

LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
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- OPEN SPACE
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- POTABLE WATER SUPPLY LINE
- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN
- BOOSTER PUMP

QUEENSLAND
NEW SOUTH WALES

300Ø
225Ø
150Ø

PRELIMINARY ISSUE
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A	ISSUED FOR INFORMATION	07-07-16	DH	-	AW	-
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EMAIL: admin@planitengineering.com.au

CLIENT:
NWS
NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
DRINKING WATER SCHEME
DETAILED SHEET 1 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0007	B

LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
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N

INDICATIVE ZONE BOUNDARY VALVES

PRELIMINARY ISSUE
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B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-

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SUITE 9A, 80-84 BALLINA STREET
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LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
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PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
DRINKING WATER SCHEME
DETAILED SHEET 2 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-

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PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT: NWS NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE
DRAWING TITLE: SERVICING MASTER PLANS
DRINKING WATER SCHEME
DETAILED SHEET 3 OF 5

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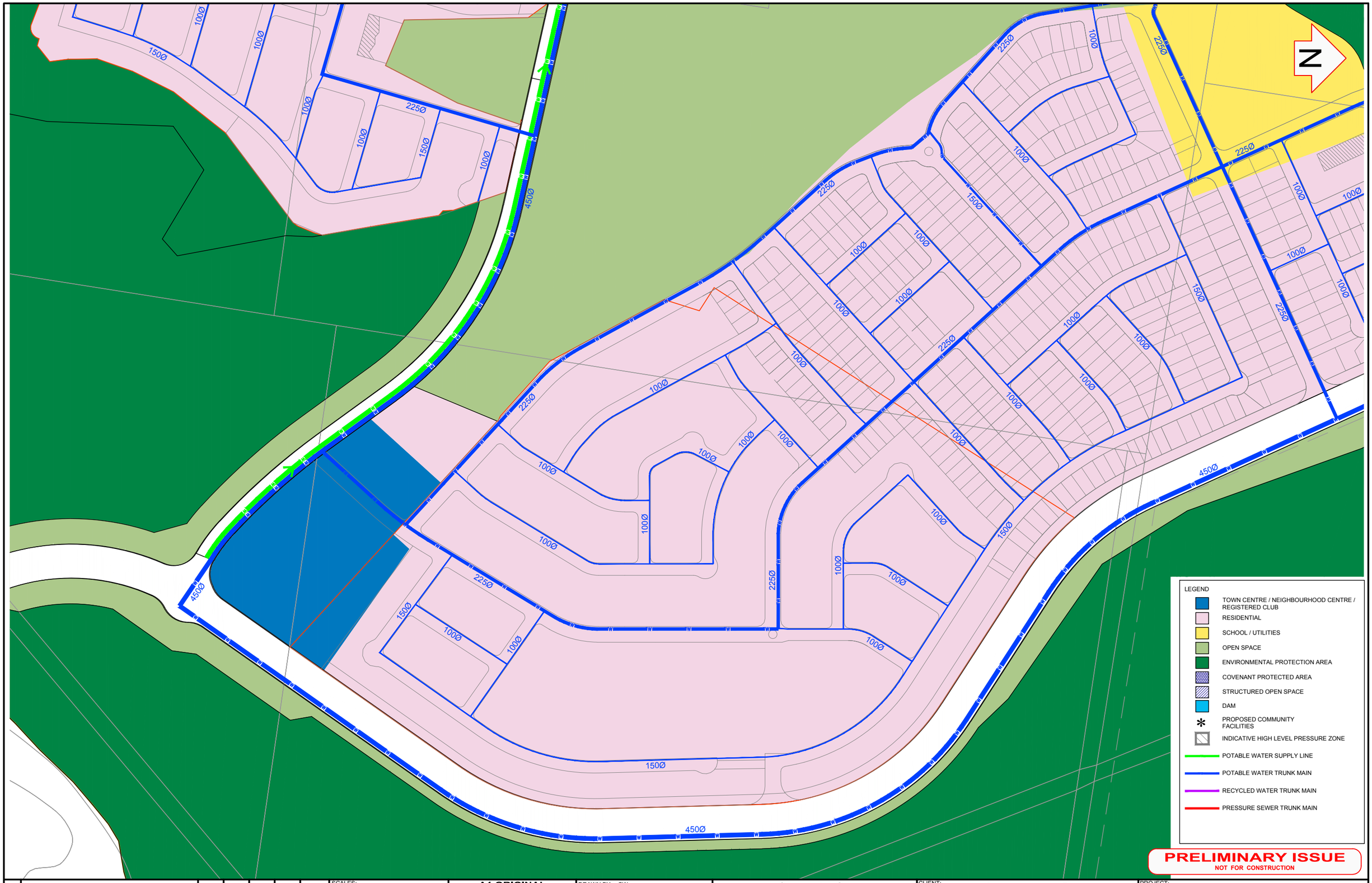

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B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-

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PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
DRINKING WATER SCHEME
DETAILED SHEET 4 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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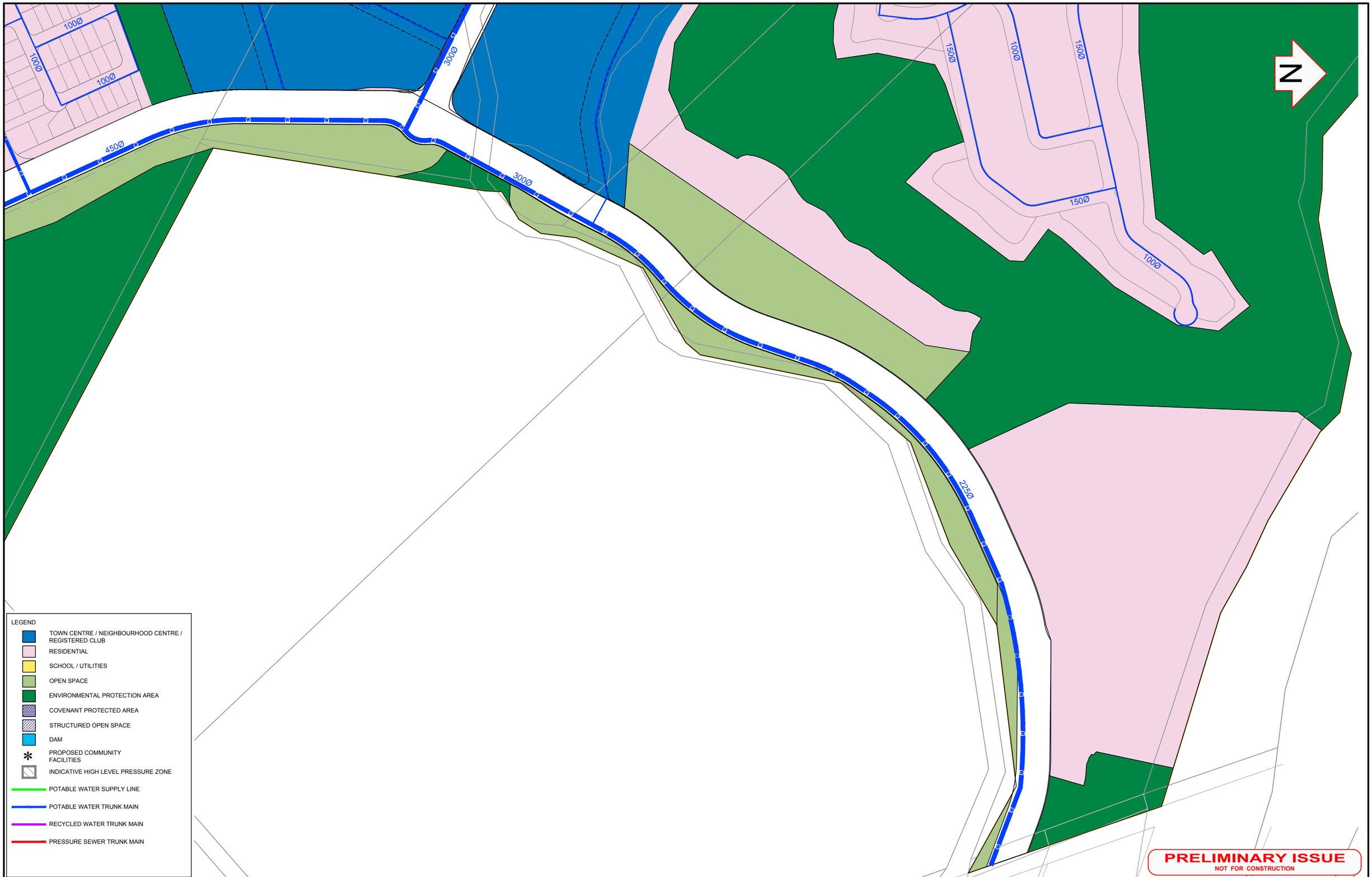

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- PRESSURE SEWER TRUNK MAIN

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR INFORMATION	07-07-16	DH	-	AW	-
B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-

SCALES:

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES

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DESIGN BY: CW
APPROVED BY:
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PO BOX 161
LENNOX HEAD NSW 2478

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ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:
NWS
NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

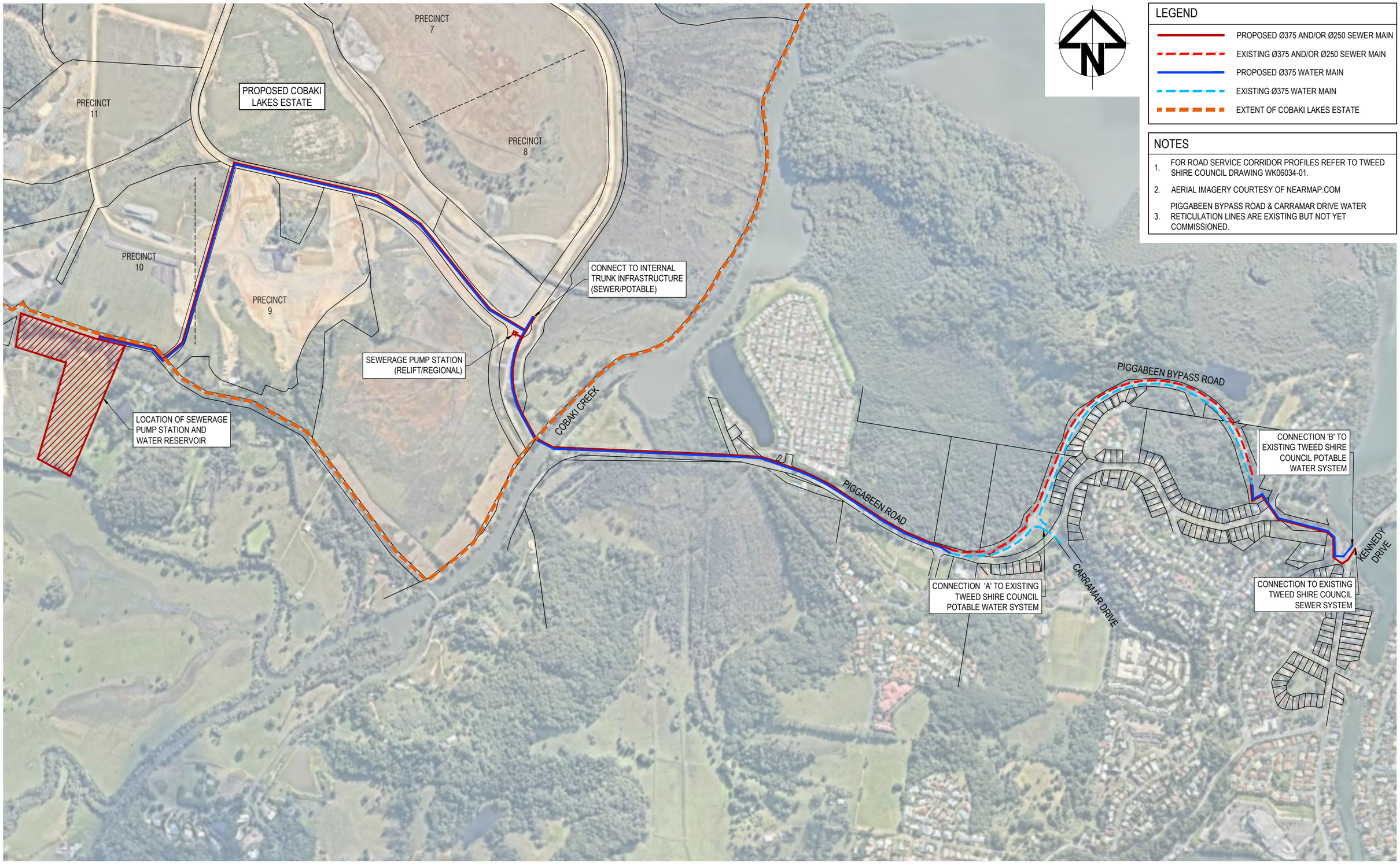
LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
DRINKING WATER SCHEME
DETAILED SHEET 5 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0011	B

Appendix 4.1.3A. Drinking Water Plan Source to Storage



LEGEND

- PROPOSED Ø375 AND/OR Ø250 SEWER MAIN
- EXISTING Ø375 AND/OR Ø250 SEWER MAIN
- PROPOSED Ø375 WATER MAIN
- EXISTING Ø375 WATER MAIN
- EXTENT OF COBAKI LAKES ESTATE

NOTES

1. FOR ROAD SERVICE CORRIDOR PROFILES REFER TO TWEED SHIRE COUNCIL DRAWING WK06034-01.
2. AERIAL IMAGERY COURTESY OF NEARMAP.COM
3. PIGGABEEN BYPASS ROAD & CARRAMAR DRIVE WATER RETICULATION LINES ARE EXISTING BUT NOT YET COMMISSIONED.

Issue	Description	By	Ckd	RPEQ	Date
03	PUMP STATION AMENDMENT	BS	SP		
02	SERVICE CONNECTION POINTS AMENDED	NF	SP		22.07.16
01	ORIGINAL ISSUE	NF	SP		19.07.16

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Surveyor: MICHEL GROUP SERVICES

Architect:

Filename: Skc-00-001-aa008836-gcd-Schematic Wat + Sew - Piggabeen.dwg

Client: LEDA MANORSTEAD

Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

Approved: R.P.E.Q No :

Scales: 1:5000 — Original Issue Signatures

Original Size: A1 — Drawn N.FAHEY; Designed S.POLLARD

Height Datum: AHD — Project Manager S.POLLARD

Grid: MGA (GDA94) —

Project: COBAKI LAKES ESTATE

Title: TWEED SHIRE COUNCIL TO NORTHERN WATER SOLUTIONS SERVICE CONNECTION SCHEMATIC WATER AND SEWER LAYOUT CONNECTION TO END (SOURCE)

ARCADIS
Arcadis Australia Pacific Pty Limited
P O Box, 1653
Southport QLD 4215
ABN 76 104 485 289
Tel No: +61 7 5532 3933
Fax No: +61 7 5591 4778
www.arcadis.com

Drawing No. SKC-00-001 — Project No. AA008836 — Issue 03

100mm on Original

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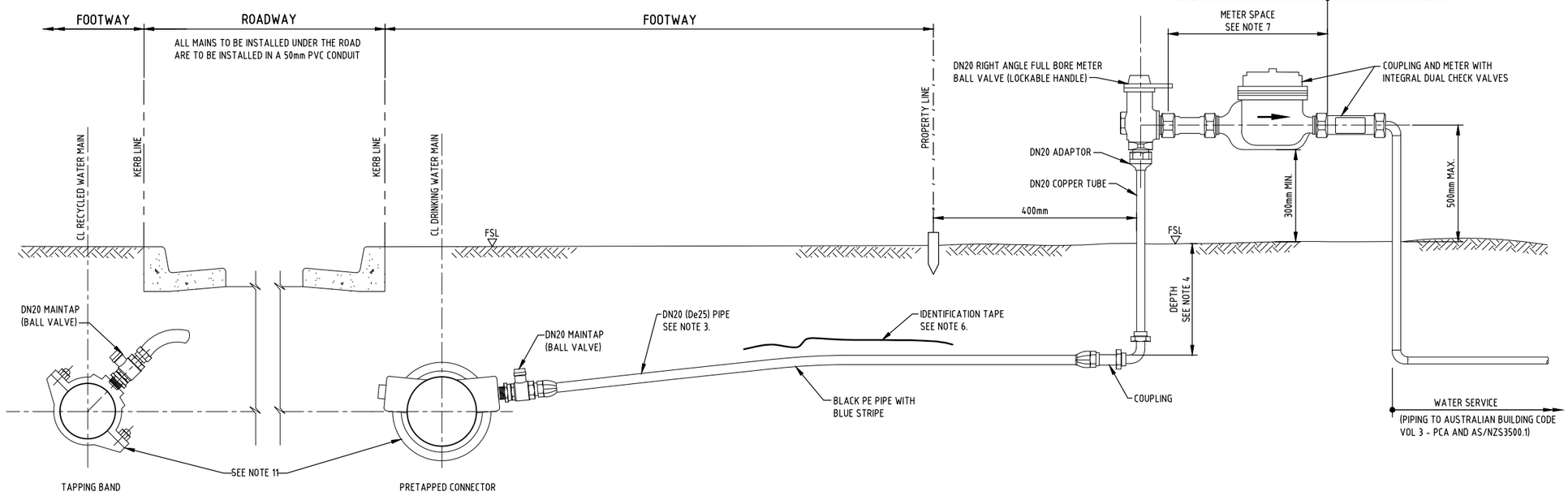
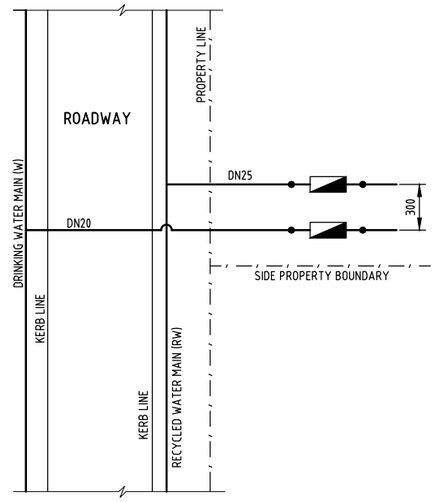
Appendix 4.1.5A. Standard Metered Drinking Water Service Drawings 1 & 2

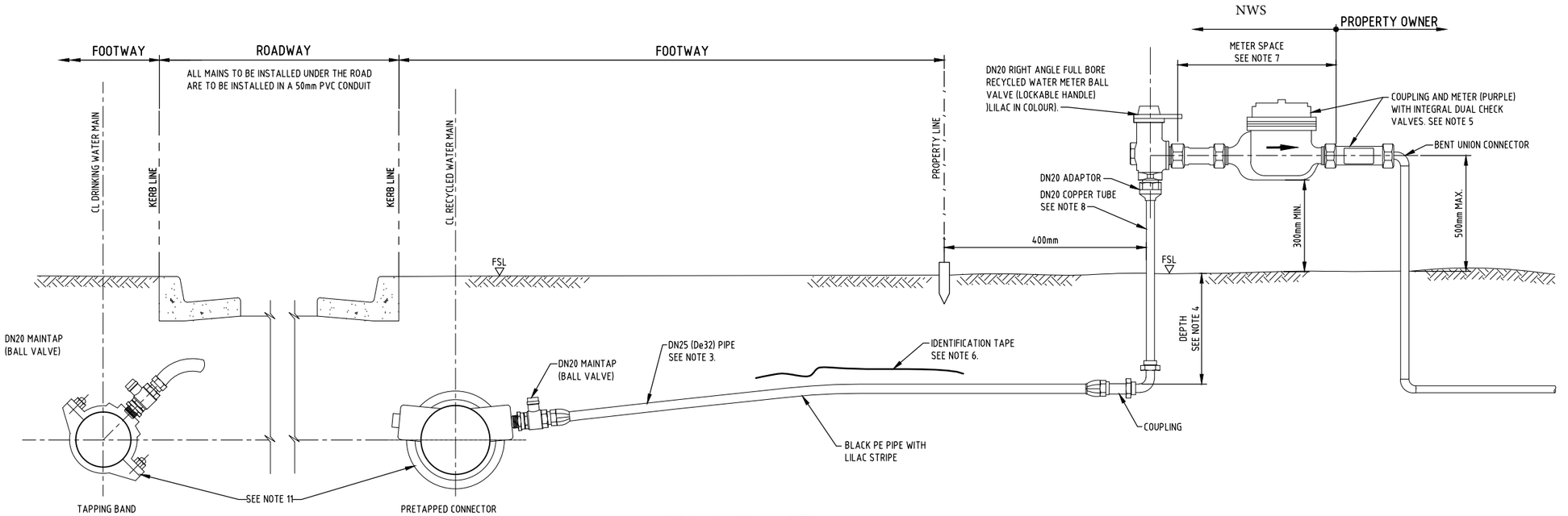


APPROVED TAPPING METHODS
SEE NOTE 2

DRINKING WATER
SECTIONAL ELEVATION
TYPICAL SINGLE PROPERTY SERVICES PRE-LAID IN FOOTWAY



PLAN
PROPERTY SERVICES LAYOUT
NTS



APPROVED TAPPING METHODS
SEE NOTE 2

RECYCLED WATER
SECTIONAL ELEVATION
TYPICAL SINGLE PROPERTY SERVICES PRE-LAID IN FOOTWAY

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

2. FOR APPROVED TAPPING METHODS, SEE WAT-1852-S (DICL MAINS) AND WAT-1853-S (PVC PR GRP MAINS). (SYDNEY WATER)

3. PROPERTY SERVICES CONNECTED TO PVC MAINS:
   ALL MATERIALS FOR USE IN PROPERTY SERVICES SHALL BE IN ACCORDANCE WITH THE AUSTRALIAN BUILDING CODE VOL 3 - PLUMBING CODE OF AUSTRALIA AND AS/NZ 3500.1 (MIN PN15).ALL PROPERTY SERVICE PIPE FOR RECYCLED WATER SHALL BE COLOURED BLACK WITH LILAC (P23) STRIPES (LONGITUDINAL) TO AS 2700.
   WHERE THE NOMINAL SIZE OF A PIPE IS SPECIFIED, AN EQUIVALENT PIPE SIZE APPROPRIATE TO THE MATERIAL BEING USED TO BE AS SPECIFIED IN AS 3500.1, TABLE 1.1.
   PROPERTY SERVICES TO BE CONTINUOUS (WITHOUT JOINTS) BETWEEN MAINTAP BALL VALVE AND METER RISER.

4. DEPTHS TO BE IN ACCORDANCE WITH ABC VOL 3 - PCA AND AS/NZ 3500.1

5. METERS WITH DUAL CHECK VALVES REQUIRED FOR DRINKING WATER AND RECYCLED WATER PROPERTY SERVICES.

6. PROVIDE IDENTIFICATION TAPE ON ALL PROPERTY SERVICES WITHIN THE FOOTWAY & ROADWAY UP TO THE BALL VALVE.
   AS APPROPRIATE, TAPE TO BE COLOURED:
   (i) "LILAC" AND MARKED "CAUTION RECYCLED MAIN BURIED BELOW - DO NOT DRINK" OR
   (ii) "GREEN" AND MARKED "CAUTION WATER MAIN BURIED BELOW"

7. METER SPACE -
   DRINKING AND RECYCLED WATER
   METER SPACE FOR DRINKING WATER IS THE DISTANCE BETWEEN THE THREADED END OF THE BALL VALVE AND THE THREADED END OF THE ELBOW. DISTANCES ARE AS FOLLOWS:

METER SIZE	20	25
METER SPACE	300	300

8. USE COPPER TUBE PRECOATED WITH LILAC COLOURED PE FOR RISERS ON RECYCLED WATER SERVICES.
   USE COPPER TUBE FOR POTABLE WATER SERVICE.

9. INSTALL SERVICES FROM MAIN TO METER IN A STRAIGHT LINE AND AT RIGHT ANGLES TO KERB LINE.

10. LOCATE PROPERTY SERVICES FROM MAIN TO METER, (DRINKING AND RECYCLED WATER) IN THE ONE STREET ONLY, AT FRONTAGE OF PROPERTIES. PLACE DRINKING AND RECYCLED WATER METERS TOGETHER 400mm FROM THE FRONT BOUNDARY AND PARALLEL TO A SIDE BOUNDARY WITHIN A DISTANCE OF 600mm.

11. RECYCLED WATER MAIN & POTABLE WATER MAIN TO BE LOCATED ON OPPOSITE SIDES OF ROAD.

12. POTABLE AND RECYCLED WATER METERS TO BE INSTALLED ON OPPOSITE SIDES OF PSU IF LOCATED ON THE SAME PROPERTY.

FOR INFORMATION

A1

INDEX	DATE	REVISIONS	DRAWN	CHECKED	PASSED
A		ISSUED FOR INFORMATION			

NORTHERN WATER SOLUTIONS

Northern Water Solutions

STANDARD DRAWING
DUAL WATER RETICULATION SYSTEM
SINGLE PROPERTY SERVICES
PRE-LAID IN FOOTWAYS

SCALE NOT TO SCALE
SHEET 1 OF 1 SHEETS
DRAWING NO. NWS-STD-WAT-1
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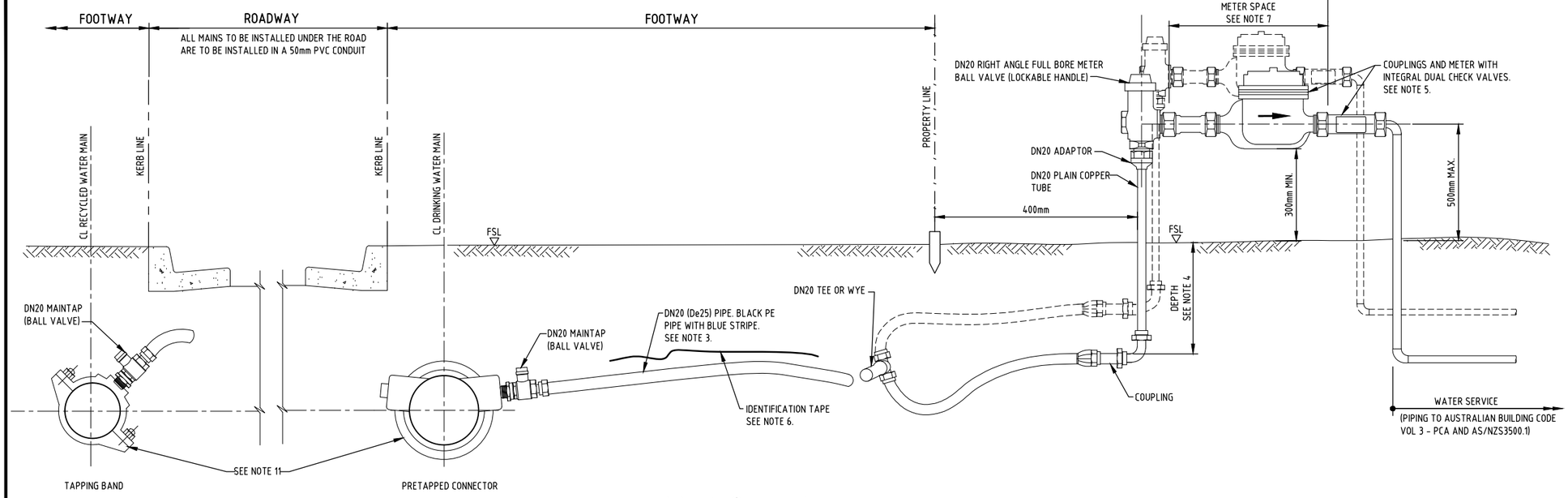
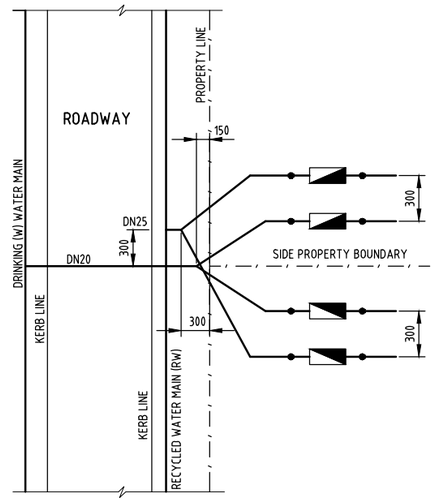


APPROVED TAPPING METHODS
SEE NOTE 2

DRINKING WATER
SECTIONAL ELEVATION
TYPICAL SPLIT PROPERTY SERVICES PRE-LAID IN FOOTWAY



PLAN
PROPERTY SERVICES LAYOUT
("Y" SYSTEM SHOWN)
NTS

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
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   PROPERTY SERVICES TO BE CONTINUOUS (WITHOUT JOINTS) BETWEEN MAINTAP BALL VALVE AND METER RISER.
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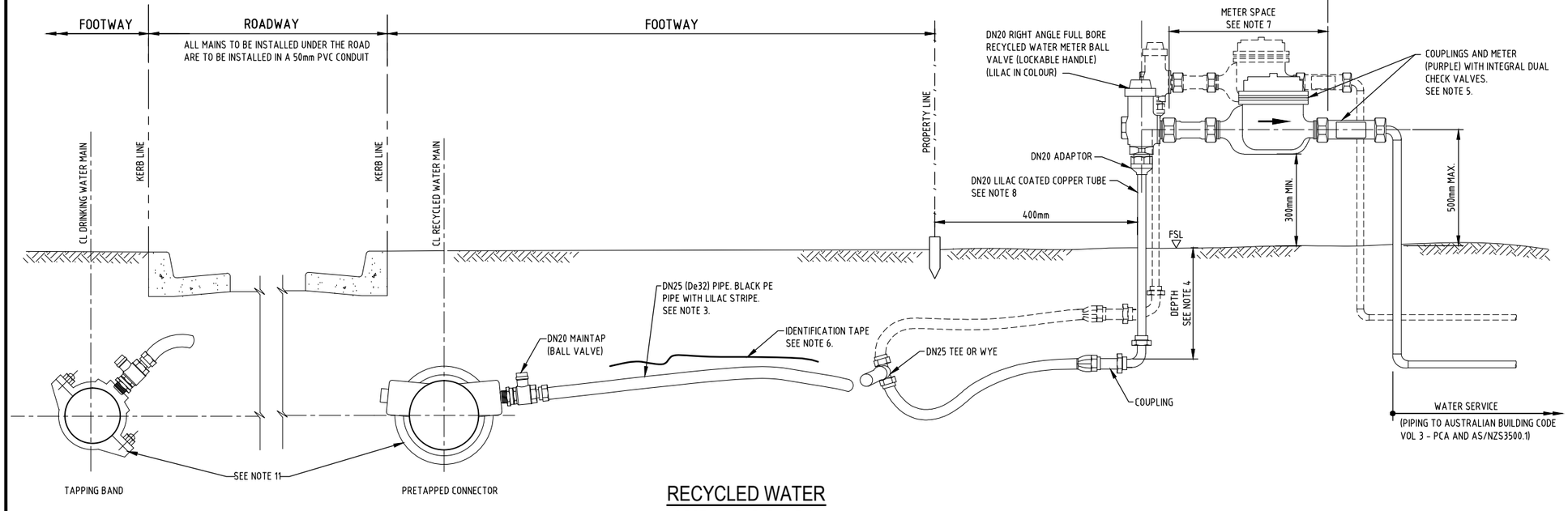
12. METERS TO BE LOCATED IN ACCORDANCE WITH NWS "GUIDELINES".
13. POTABLE AND RECYCLED WATER METERS TO BE INSTALLED ON OPPOSITE SIDES OF PSU IF LOCATED ON THE SAME PROPERTY.



APPROVED TAPPING METHODS
SEE NOTE 2

RECYCLED WATER
SECTIONAL ELEVATION
TYPICAL SPLIT PROPERTY SERVICES PRE-LAID IN FOOTWAY

FOR INFORMATION

INDEX	DATE	REVISIONS	DRAWN	CHECKED	PASSED
A		ISSUED FOR INFORMATION			

A1

NORTHERN WATER SOLUTIONS

Northern Water Solutions

NORTHERN WATER SOLUTION STANDARD DRAWING
DUAL WATER RETICULATION SYSTEM
SPLIT PROPERTY SERVICES
PRE-LAID IN FOOTWAYS

SCALE NOT TO SCALE
SHEET 1 OF 1 SHEETS
DRAWING NO. NWS-STD-WAT-2
A

Appendix 4.1.6A. Copy of Cobaki Water Balance Report

Cobaki Residential Development, Tweed Heads Water Balance Summary

Northern Water Solutions Pty Ltd

WGM Consulting

September 2016

Document No. J116 - RPT001 – Final Rev 03

Document Status

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Project Details

Project Name:	Water Balance Summary – Cobaki Residential Development, Tweed Heads
Client	Northern Water Solutions Pty Ltd
CEO	Wayne Williamson
Authors	Andrew Wells
WGM Reference:	J116 – RPT001 – Final Rev 03

WGM Consulting
ABN 59 210 741 429
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
wgm@wgmconsulting.com.au

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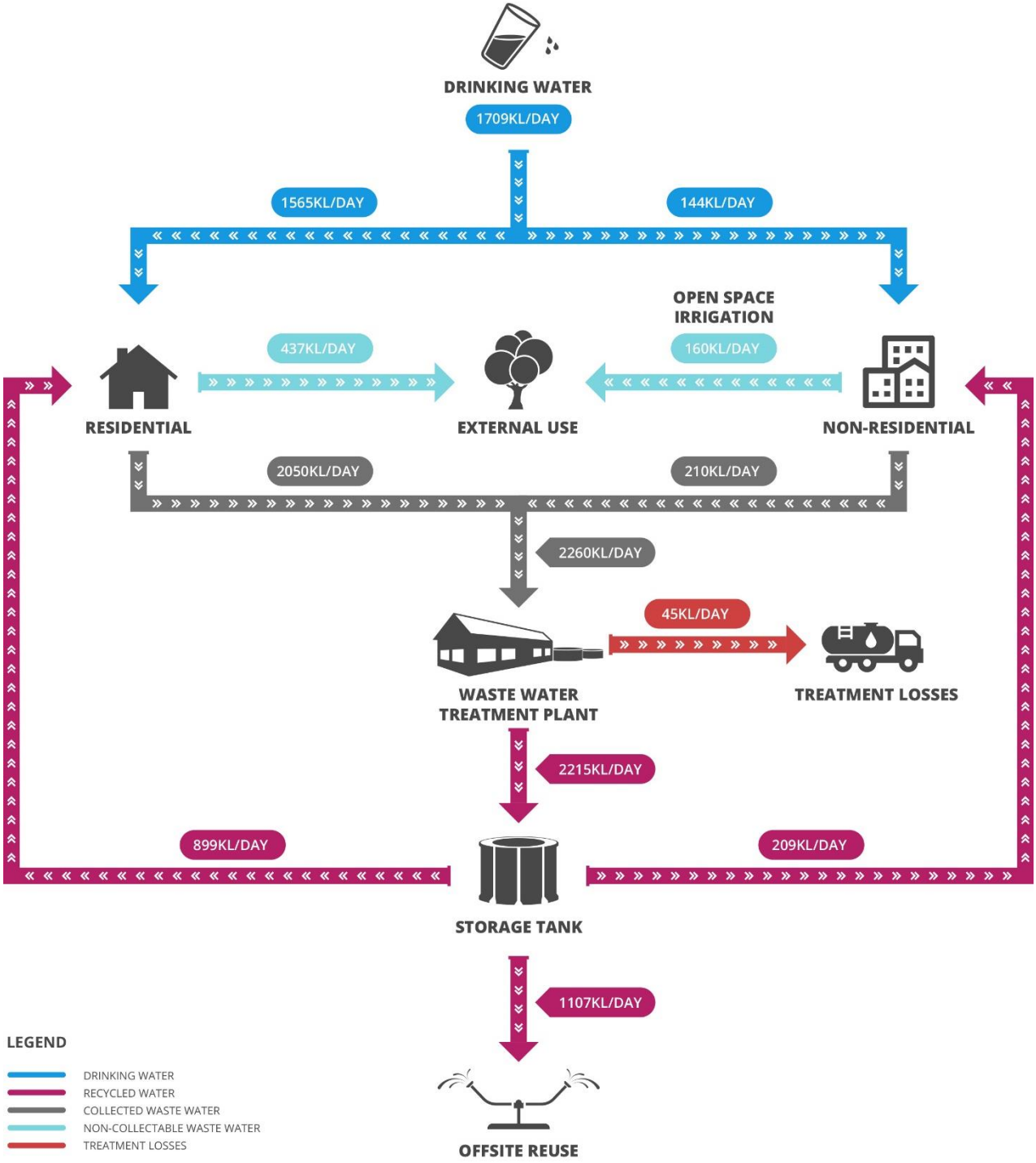
Executive Summary

The Cobaki development is located at Tweed Heads NSW and is in the Tweed Shire Council Local Government area. The development will ultimately comprise of:

- 5,500 Residential type dwellings,
- A local commercial area of 15 hectares,
- A school precinct for up to 1,000 Students,
- A Registered Club facility,
- A local Child Care Centre,
- 20 hectares of Open Space & Sports Fields,

The Cobaki Residential Development Water & Waste Water Scheme will be provided by a Private Water Utility. The Cobaki Water and Waste Water Scheme will be staged over time as the development builds out towards maturity and will provide the following.

- A Pressure Sewer Collection system.
- A Drinking water reticulation network including fire hydrants with a metered service to each customer.
- A Recycled water reticulation network for domestic reuse suitable for Toilet flushing, Cold water connection to Washing machines, Garden watering, Car washing, Wash down and open space irrigation areas with a metered service connection to each customer.
- A Waste Water Treatment Plant which incorporates a Membrane Bio Reactor, UV disinfection, 2ML Permeate Storage Tank for Class A treated effluent for feed water to the AWTP and another 2ML Storage Tank for storage of excess permeate mainly during wet weather events (132 days PA) for controlled release to the existing TSC sewerage network and extra Redundancy Tank Storage for the pressure sewer network in case of an emergency.
- An Advanced Water Treatment plant which incorporates an Ultra filtration system, UV disinfection and Chlorine contact addition unit and transfer pumps to transfer the Class A+ treated effluent to the storage reservoirs.
- 8ML of Reservoir Storage will provide 4 days of storage for the Drinking Water network in the case of an emergency. Pressure and flow will be maintained throughout the network by a Variable Speed Drive pump station with post Chlorine addition if required. The pump station will maintain a higher pressure in the drinking water network than the recycled water network to help avoid any cross contamination.
- The drinking water will be supplied to the development Reservoir Storage via a metered supply under agreement with the Local Shire Council.
- 4ML of Reservoir Storage will provide 4 days of Class A+ Recycled Water for domestic reuse in the case of an emergency. The pressure and flow will be maintained throughout the network by a Variable Speed Drive pump set. The end users will be supplied 100% Class A+ recycled water with no drinking water top up required. Recycled water will be used to irrigate open space areas only when available or supplied to offsite customers under agreement.
- With the Recycled Water scheme proposed for this development the dwellings in the precincts will achieve on average a Basix water score of 67. To achieve the Basix water targets without the recycled water scheme being in place, the dwellings at the Cobaki development would be required to install individual rain water tanks which would be connected for both toilet flushing and outside garden watering. Rain Water tanks therefore are not required.
- The emergency discharge of excess Recycled Water during wet weather events will be discharged via a discharge rising main to a metered connection point (TSC Pump Sewerage Station) under an agreement with the Local Council on the daily flow that can be discharged to the Council sewer and the total discharge allowable will be capped per annum.



Note: Wet weather events Average 132 days PA at least 50% (554KLD) will not be used for other uses. Average daily discharge of 500 KLD PA (365 days) has been allowed for.

Figure 1 – Cobaki Integrated Water Scheme Average Daily Demand

1 Project Details

The purpose of this report is to document the water balance analysis for the Cobaki Estate Development to summarise the total development drinking water consumption required, the recycled water consumption required, the wastewater generation that will treated on site by the WWTP and the external watering requirements for recycled water, in order to inform the servicing strategy and the overall system design.

The Cobaki Development Site is owned by Leda Manorstead Developments (LM) which has appointed Northern Water Solutions Pty Ltd (NWS) to be the Private Water Authority providing an integrated water scheme to service the development. NWS will hold an IPART Network Operators and Retail Licence under the WIC Act (2006) NSW issued by IPART NSW. NWS will be responsible for providing all the drinking water supply, the recycled water supply for both domestic reuse and open space irrigation purposes, the wastewater collection services and the treatment of all waste water within the development boundaries.

The proposed development includes an on-site MBR Waste Water Treatment Plant (MBR) and an Advanced Water Treatment Plant (AWTP) to produce Class A+ recycled water for domestic reuse and uncontrolled irrigation purposes.

The Cobaki Residential Development site is located at Piggabeen Road, Tweed Heads and is adjacent to the Tugun Bypass on the Gold Coast Highway, and Gold Coast Airport.

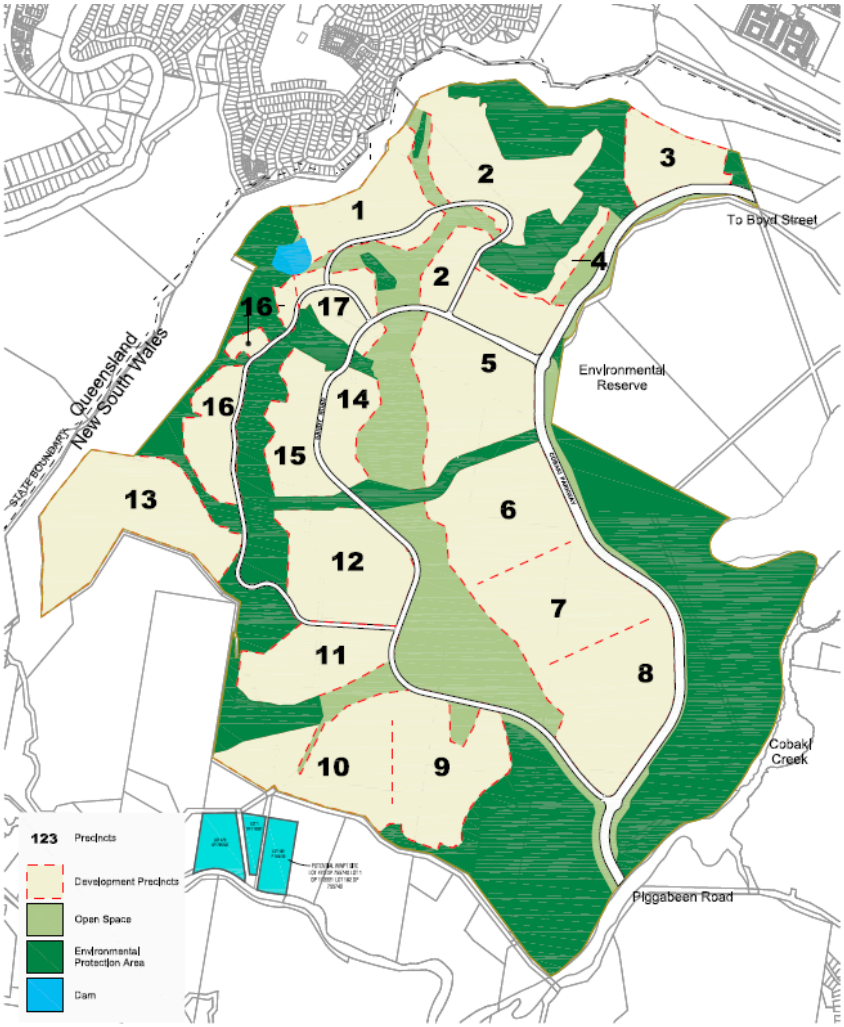


Figure 2 – Proposed Cobaki Development

The developable area is approximately 333 Ha and includes a combination of 18 residential development precincts, central retail precinct, 1 educational precinct and approximately 20 Ha of public open space including sporting fields.

The proposed development is expected to yield approximately 5,500 residential lots and when including the educational and commercial precincts is expected to have a total equivalent tenement yield of approximately 6,064 lots. These yields are summarised in the following development summary Equivalent Tenement Yield tables below.

Table 1 – Proposed Developable Area Summary

Land Use	Area
Total Developable Area	**333 Ha**
Residential Development	292 Ha
School and Child Care Precinct	6 Ha
Commercial Precinct	15 Ha
Public Open Space	20 Ha

Table 2 – Proposed Equivalent Tenement Yield

Precinct	Area (Ha)	ET/Dwelling	No. of ET
Residential Development			
P1	16.928	1 ET/Dwelling	338
P2	28.004	1 ET/Dwelling	560
P3	10.564	1 ET/Dwelling	211
P4	3.268	1 ET/Dwelling	40
P6	15.389	1 ET/Dwelling	307
P7	32.825	1 ET/Dwelling	656
P8	16.96	1 ET/Dwelling	339
P9	22.12	1 ET/Dwelling	442
P10	21.854	1 ET/Dwelling	437
P11	15.28	1 ET/Dwelling	305
P12	21.95	1 ET/Dwelling	439
P13	28.94	1 ET/Dwelling	578
P14	7.876	1 ET/Dwelling	157
P15	11.691	1 ET/Dwelling	234
P16	13.32	1 ET/Dwelling	266
P17	8.256	1 ET/Dwelling	165
SSPP Balance	1.322	1 ET/Dwelling	26
Subtotal	**276.55**		**5,500**
Non-Residential Development			
Precinct 5 – Commercial	15	0.003ETm^2	450
Precinct 6 - School	3.5	1000 Students x 0.03ET/Student	30
SSPP Club	2.5	0.03ET/m^2	75
SSPP Child Care	0.5	150 Children x0.06ET/Child	9
Open Space	20	Irrigation as per Sporting Field Requirements	
Subtotal	**56.5**		**564**
Total	**333.047**		**6,064**

2 Average Daily Water Demands and Wastewater Generation Rates

The water demands and wastewater generation rates for the proposed development have been calculated using typical daily residential demand by end use consumption data, and the number of equivalent tenements. These end use consumption demand figures are based on the *'NSW Government – Your Home Technical Manual, 2013'* and have assumed an average home with WELS 3 Star rated fixtures.

2.1 Residential Water Demands

The average daily residential water demands per residential equivalent tenement are summarised in the table below. These end use consumption figures include an average daily allowance for external water usage for garden watering and car washing. There may be slight variation in these typical daily external consumption demands based on rainfall and irrigation requirements.

Table 3 – Residential End Use and Average Daily Demand

End Use Water Specification and Average Daily Consumption - 3 Star WELS Rating						
	Per Person Demand L/day	Per Person Daily Demand (L/Day)		Daily Demand Per ET (2.8 EP/ET)		
Water End Use		Drinking Water	Recycled Water	Drinking Water	Recycled Water	Total (L/day)
Toilet	20		20	0	56	56
Shower	63	63		176.4	0	176.4
Hand Basin	6	6		16.8	0	16.8
Washing Machine	13	1.95	11.05	5.46	30.94	36.4
Laundry Tap	2	2		5.6	0	5.6
Kitchen Tap	12	12		33.6	0	33.6
Dishwasher	5	5		14	0	14
Leaks	1.2	1.2		3.36	0	3.36
Pool/Spa	10.5	10.5		29.4	0	29.4
Car Washing	0.5		0.5	0	1.4	1.4
Garden Irrigation	26.8		26.8	0	75.04	75.04
Total	**160**	**101.65**	**58.35**	**284.62**	**163.38**	**448**

**Based on the 'NSW Government – Your Home Technical Manual, 2013' assumed average WELS 3 Star rated fixtures*

2.2 Non - Residential Water Demands

The non-residential water demands have been calculated based on the number of equivalent tenements for each proposed usage as identified in Table 2 above. However due to the reduced demand for external water usage for irrigation requirements in non-residential precincts for the purposes of this assessment these external water demands have been removed from the end use consumption figures as outlined in Table 4 below.

Table 4 – Non-Residential End Use and Average Daily Demand Per Equivalent Tenement

Non-Residential End Use Water Consumption						
	Per Person Demand L/day	Per Person Daily Demand (L/Day)		Demand Per Equivalent ET (2.8 EP/ET)		
Water End Use		Drinking Water	Recycled Water	Drinking Water	Recycled Water	Total (L/day)
Toilet	20		20	0	56	56
Shower	63	63		176.4	0	176.4
Hand Basin	6	6		16.8	0	16.8
Washing Machine	13	1.95	11.05	5.46	30.94	36.4
Laundry Tap	2	2		5.6	0	5.6
Kitchen Tap	12	12		33.6	0	33.6
Dishwasher	5	5		14	0	14
Leaks	1.2	1.2		3.36	0	3.36
Pool/Spa	0	0		0	0	0
Car Washing	0		0	0	0	0
Garden Irrigation	0		0	0	0	0
Total	**122.2**	**91.15**	**31.05**	**255.22**	**86.94**	**342.16**

2.3 Wastewater Generation Rates per Equivalent Tenement – Residential and Non-Residential

Given the total development yield has been calculated as a total number of equivalent tenements, the wastewater generation demand rates have been calculated based on the assumption of 2.8 EP/ET using the wastewater generation figures in the table below.

Table 5 – Average Daily Wastewater Generation per Equivalent Tenement

Wastewater Generation Per Equivalent Tenement - 3 Star WELS Rating		
Wastewater Source	Per Person Generation (L/day)	Generation Per ET (L/day)
Toilet	20	56
Shower	63	176.4
Hand Basin	6	16.8
Washing Machine	13	36.4
Laundry Tap	2	5.6
Kitchen Tap	12	33.6
Dishwasher	5	14
Leaks	-	-
Pool/Spa	-	-
Car Washing	-	-
Garden Irrigation	-	-
Total	**121**	**338.8**

**Based on the 'NSW Government – Your Home Technical Manual, 2013' assumed average WELS 3 Star rated fixtures*

2.4 Average Daily Water Balance per Household

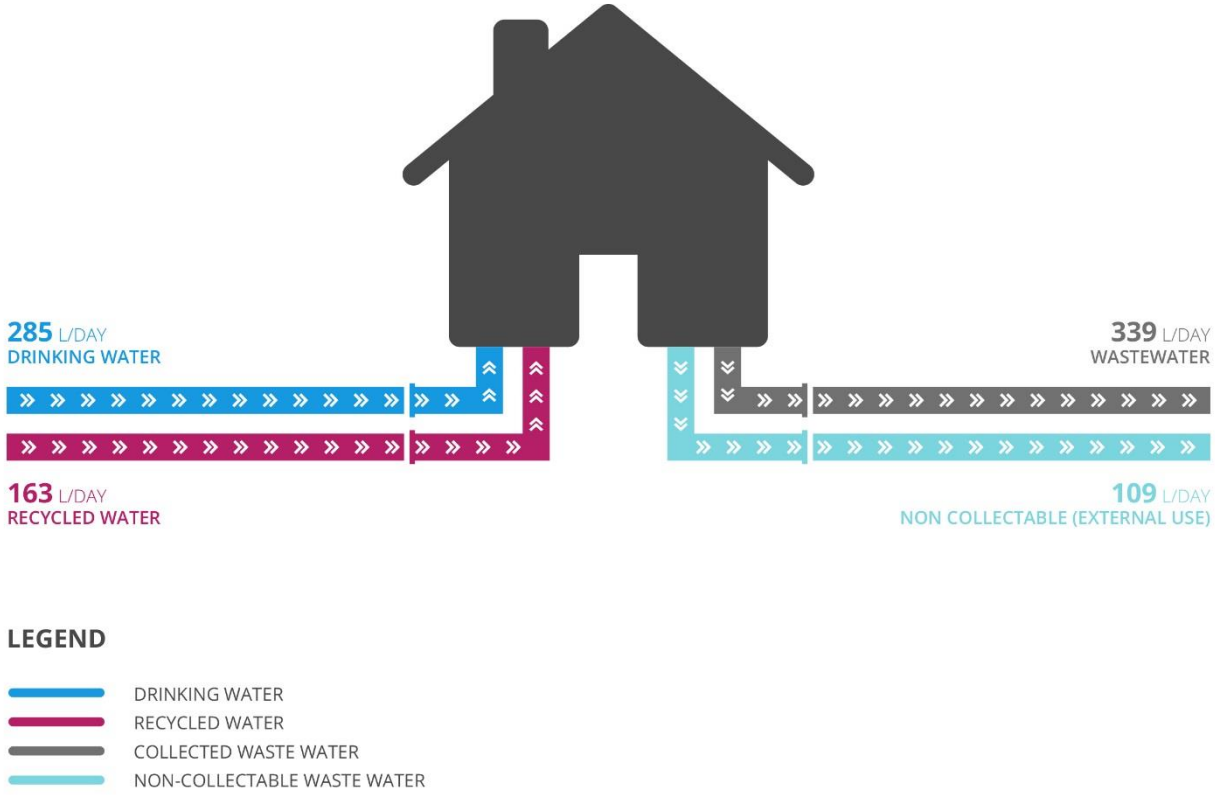


Figure 3 – Average Daily Water Balance Per Household

3 Public Open Space Irrigation Water Demand

The proposed public open space within the development shall consist of a combination of sporting fields and open parkland. It is assumed that the extensive sporting fields proposed for the site will require approximately half of the proposed 20 Ha of nominated open space. The volume of water required for the irrigation of the developments public open space varies slightly based on the end use of the space, sporting fields require slightly more irrigating than general grassed open space.

The total irrigation requirement for the public open space is dependent upon several factors including rainfall and evaporation rates, and needs to take into consideration the total number of wet days during a year where no irrigation can occur. It is proposed to irrigate all open space within the development with Class A+ recycled water from the Recycled Water (Purple Pipe) domestic reuse network which runs throughout the development.

3.1 Rainfall and Evapotranspiration Rates

Daily Rainfall and Evapotranspiration Data was collected from the Bureau of Meteorology weather stations within closest proximity to the development site. Rainfall data was obtained from the 'Coolangatta' weather station. Since this weather station measures rainfall only, evapotranspiration data was obtained from the 'Gold Coast Seaway' weather station. Summarised daily historical rainfall and evapotranspiration data are presented in Table 6 and Table 7 respectively.

Table 6 – Daily Rainfall Data Collected by the BOM from the 'Coolangatta' Weather Station (Monthly Summary) (mm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	223.4	73.8	192.6	197.8	89.2	52.8	33.0	203.6	11.4	95.8	39.0	217.6
2012	529.6	174.8	136.0	244.8	46.2	233.6	74.2	0.0	3.8	16.6	71.2	181.8
2013	317.2	369.4	231.8	248.8	96.8	225.2	135.6	2.8	41.8	21.0	117.4	24.6
2014	66.8	44.0	179.8	57.2	88.8	54.4	8.4	180.0	35.0	6.0	27.4	246.4
2015	409.6	391.8	111.2	182.2	189.2	113.0	71.8	32.6	78.6	45.2	134.8	158.2
5 Year Average	**309.8**	**218.2**	**170.3**	**192.8**	**102.0**	**135.8**	**64.6**	**83.8**	**34.1**	**37.4**	**78.0**	**165.7**

Table 7 – Daily Evapotranspiration Data Collected by the BOM from the 'Gold Coast Seaway' Weather Station (Monthly Summary) (mm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	172.1	159.9	152.4	113.0	99.6	84.9	103.0	97.4	141.8	143.8	175.3	173.3
2012	155.6	157.4	141.2	112.4	98.8	79.7	89.5	120.7	136.9	172.1	183.8	204.1
2013	172.7	136.3	124.5	123.7	103.3	74.6	81.4	127.5	151.4	197.7	177.4	211.2
2014	190.3	147.4	147.8	126.2	83.0	87.4	86.4	104.9	118.3	168.3	154.3	165.7
2015	143.8	114.8	112.3	109.5	88.4	56.6	87.6	104.2	121.3	142.5	148.2	167.1
5 Year Average	**170.4**	**153.6**	**144.2**	**119.0**	**97.7**	**81.8**	**91.9**	**113.8**	**137.5**	**165.9**	**171.3**	**185.6**

Table 8 shows the historical number of 'wet days' within the vicinity of the subject site (measured at Coolangatta Weather Station). A 'wet day is defined' as any day with 5mm of rainfall or more and where irrigation shall not occur, as evident from Table 8 below, a typical year has approximately 132 wet days.

Table 8 – Typical Number of Wet Days per Annum (Data Collected by the BOM from the 'Coolangatta Weather Station)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2011	22	24	15	1	0	0	0	0	12	12	28	23	**137**
2012	17	23	12	9	1	0	0	2	10	24	25	27	**150**
2013	22	15	8	1	0	0	0	4	15	28	22	26	**141**
2014	27	20	17	4	0	0	0	0	3	24	16	21	**132**
2015	16	12	9	3	0	0	0	1	6	10	19	23	**99**
5 Year Average	21	19	12	4	0	0	0	1	9	20	22	24	**132**

Distribution of 'wet days' throughout a typical year is presented in Figure 4.

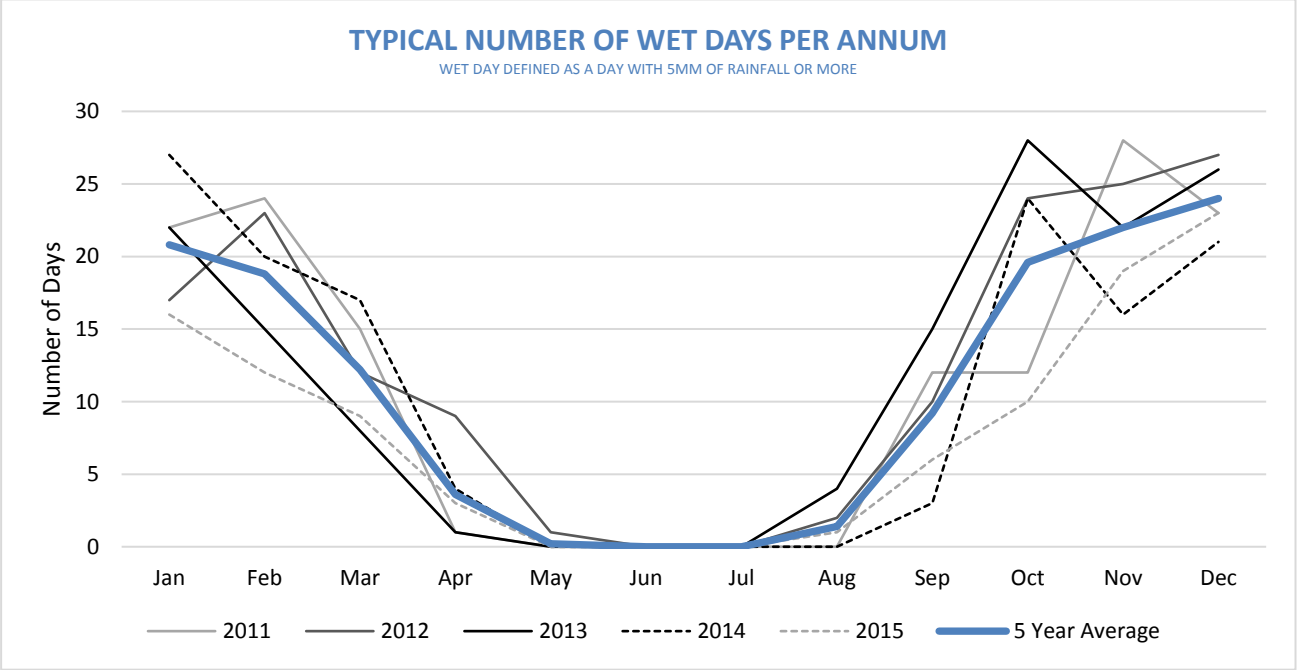


Figure 4 – Typical Distribution of Wet Days During a Year

3.2 Irrigation Requirements

To estimate the requirements to provide irrigation to open spaces within the development, hydrological modelling was carried out. The hydrological modelling method adopted is based on the principles of water balancing where total rainfall and irrigation should equal evapotranspiration and losses through percolation and runoff.

Inputs for the model include historical rainfall and evapotranspiration data, characteristics of the area to be irrigated and rainfall effectiveness (i.e. water loss via runoff and percolation). Modelling assumptions and inputs are as following:

- **Rainfall.** Historical rainfall data (daily interval) collected by the bureau of meteorology (BOM) for the period 2011-2015 from the 'Coolangatta' weather station.

- **Evapotranspiration.** Historical evapotranspiration data (daily interval) collected by the BOM for the period 2011-2015 from the 'Gold Coast Seaway' weather station.
- **Area to be irrigated.** An estimated total area of 20ha requires irrigation. It is assumed that 10ha can be classified as 'Passive Recreational Turf' (TQSV4) and 10ha can be classified as 'Local Sports Turf' (TQSV3).
- **Distribution Uniformity.** A correction should be made for inefficiencies in the irrigation system to quantify the proportion of water applied that is effectively used for irrigation purposes. Based on the literature, a well-designed irrigation system should have a Distribution Uniformity (DU) of at least 75%. A DU of 75% is assumed in the model.
- **Crop Specifics.** Corrections in effective evapotranspiration should be made to account for specific type of turf (crop coefficient K_c) and purpose of the turf (crop stress factor K_s). It is assumed that:
  - $K_c = 0.7$
  - K_s for TQVS3 = 0.5
  - K_s for TQVS4 = 0.4
- **Rainfall Effectiveness.** Effective Rainfall Factor (P_f) of 0.5 is assumed. This is the rainfall effectively used to deliver water to turf roots, taking in account runoff and evaporation, guidelines recommend assuming 50% effectiveness.

The total open space irrigation requirements have been calculated in accordance with the recommendations and calculation formula from SA Water 'Code of Practice Irrigated Open Space'. This formula has been adopted as it is recommended for use by the Bureau of Meteorology for assessing open space irrigation assessments. The 'Code of Practice Irrigated Open Space' classifies the irrigation parameters as follows:

- Effective Rainfall, P_e (mm) = $P \times P_f$
  - Where P= total monthly historical rainfall (mm)
- Crop Evapotranspiration, ET_c (mm) = $ET_0 \times k_c \times k_s$
  - Where ET_0 is total monthly historical evapotranspiration (mm)
- Net Irrigation Requirement, I_n (mm) = $ET_c - P_e \geq 0$
- Irrigation Requirement, I_r (mm) = I_n / DU

The projected monthly irrigation requirement calculations are presented in Table 9 below.

Table 9 – Projected Daily Irrigation Requirements (Monthly Summary)

	P (mm)	ET_0 (mm)	P_e (mm)	Et_c (mm)			I_n (mm)			I_r (mm)		
				TQVS3	TQVS4	Total	TQVS3	TQVS4	Total	TQVS3	TQVS4	Total
January	309.8	170.4	154.9	59.6	47.7	107.4	17.1	11.6	28.7	22.8	15.5	38.3
February	218.2	153.6	109.1	53.8	43.0	96.8	12.5	7.2	19.8	16.7	9.7	26.3
March	170.3	144.2	85.1	50.5	40.4	90.8	15.3	10.0	25.3	20.4	13.4	33.8
April	192.8	119.0	96.4	41.7	33.3	75.0	8.4	5.9	14.2	11.1	7.8	19.0
May	102.0	97.7	51.0	34.2	27.4	61.5	9.4	6.0	15.4	12.5	8.1	20.6
June	135.8	81.8	67.9	28.6	22.9	51.5	11.3	8.1	19.5	15.1	10.8	25.9
July	64.6	91.9	32.3	32.2	25.7	57.9	15.0	10.7	25.7	20.0	14.3	34.2
August	83.8	113.8	41.9	39.8	31.9	71.7	25.8	19.9	45.7	34.4	26.5	60.9
September	34.1	137.5	17.1	48.1	38.5	86.6	35.4	26.9	62.3	47.2	35.9	83.1
October	37.4	165.9	18.7	58.1	46.4	104.5	40.7	30.3	71.1	54.3	40.5	94.8
November	78.0	171.3	39.0	59.9	48.0	107.9	32.9	23.3	56.2	43.9	31.0	74.9
December	165.7	185.6	82.9	65.0	52.0	116.9	32.0	23.1	55.2	42.7	30.9	73.6
Total	**1592.5**	**1632.6**	**796.3**	**571.4**	**457.1**	**1028.5**	**255.8**	**183.2**	**439.0**	**341.1**	**244.2**	**585.4**

Total irrigation water demands are presented in Table 10 below. Fluctuation of irrigation potential throughout a typical year is graphically presented in Figure 5. As is evident from the figures, a maximum volume of 58,500kL per annum can potentially be discharged through irrigation.

Note that the data presented in the tables in this section are monthly totals for calculations performed at daily intervals. The full dataset is presented in Appendix A.

Table 10 – Total Irrigation Water Demand (Monthly Summary)

	Irrigation Requirement (mm)			Water Demand (kL/ha)			Total Water Demand (kL)		
	TQVS3	TQVS4	Total	TQVS3	TQVS4	Total	TQVS3	TQVS4	Total
January	22.8	15.5	38.3	227.6	155.0	382.6	2275.8	1549.8	3825.6
February	16.7	9.7	26.3	166.8	96.6	263.4	1667.5	966.3	2633.8
March	20.4	13.4	33.8	204.2	133.6	337.8	2041.7	1336.3	3378.1
April	11.1	7.8	19.0	111.5	78.4	189.8	1114.6	783.8	1898.4
May	12.5	8.1	20.6	125.1	80.5	205.6	1250.7	805.2	2055.9
June	15.1	10.8	25.9	151.2	108.2	259.4	1512.0	1081.6	2593.7
July	20.0	14.3	34.2	199.7	142.5	342.2	1996.9	1425.1	3422.0
August	34.4	26.5	60.9	343.5	265.2	608.7	3435.2	2651.8	6087.1
September	47.2	35.9	83.1	472.0	359.1	831.1	4719.8	3591.3	8311.0
October	54.3	40.5	94.8	543.3	404.6	947.9	5432.8	4045.8	9478.6
November	43.9	31.0	74.9	439.2	310.2	749.3	4391.8	3101.5	7493.4
December	42.7	30.9	73.6	427.3	308.6	735.9	4273.2	3086.2	7359.4
Total	**341.1**	**244.2**	**585.4**	**3411.2**	**2442.5**	**5853.7**	**34112.1**	**24424.8**	**58536.9**

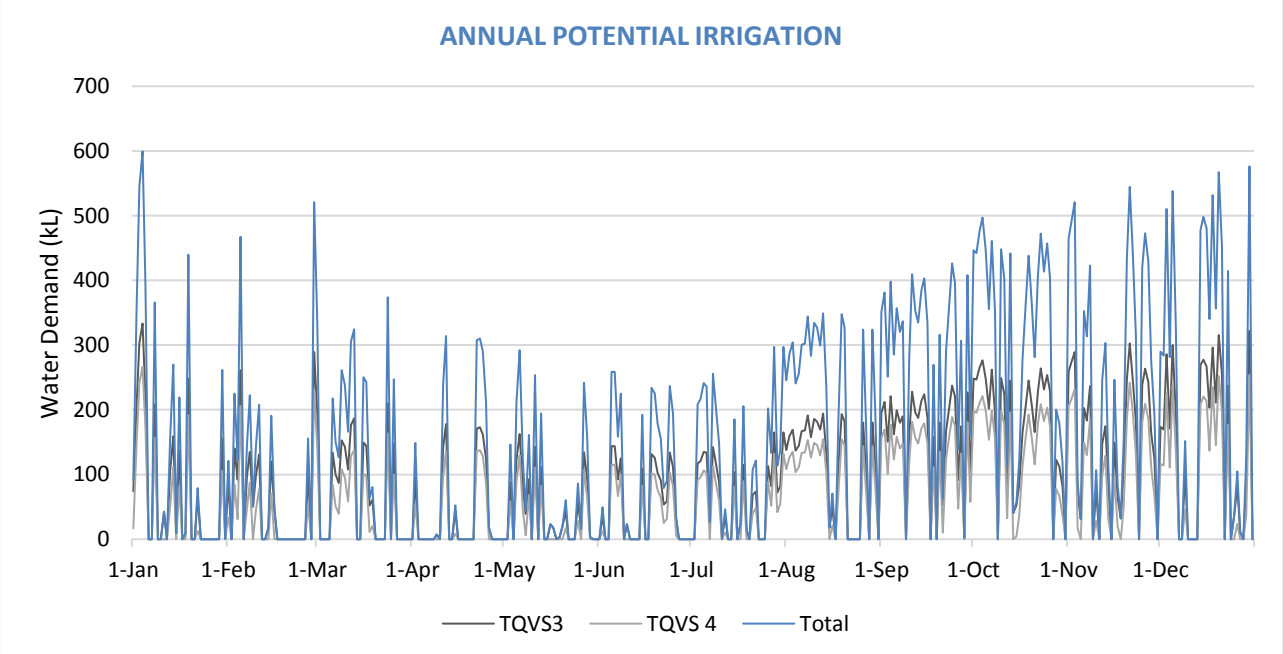


Figure 5 – Daily Irrigation Water Demand Over a Typical Year

4 Total Development Demands Based on Equivalent Tenement Yields

The total development demands for the proposed Cobaki Residential Development have been calculated using the Average Daily Water Demand and Wastewater Generation Rates summarised in Sections 2 & 3 above and the projected Equivalent Tenement Yields from Table 2. The total development demands are summarised in the table below.

Table 11 – Average Daily Total Development Demands

Average Daily Total Development Demand					
Precinct	**No. of ET**	**Drinking Water Demand (kL/Day)**	**Total Recycled Water Demand (kL/Day)**	**External Recycled Water Demand (kL/Day)**	**Wastewater Generation – Includes 10% I&I (kL/Day)**
Residential Demand					
P1	338	96.20	55.22	26.76	125.97
P2	560	159.39	91.49	43.42	208.7
P3	211	60.05	34.47	17.23	78.64
P4	40	11.38	6.54	4.40	14.91
P6	307	87.38	50.16	24.44	114.41
P7	656	186.71	107.18	50.63	244.48
P8	339	96.49	55.39	26.84	126.34
P9	442	125.80	72.21	34.57	164.72
P10	437	124.38	71.40	34.19	162.86
P11	305	86.81	49.83	24.29	113.67
P12	439	124.95	71.72	34.34	163.61
P13	578	164.51	94.43	44.77	215.41
P14	157	44.69	25.65	13.18	58.51
P15	234	66.60	38.23	18.96	87.21
P16	266	75.71	43.46	21.36	99.13
P17	165	46.96	26.96	13.78	61.49
SSPP Balance	26	7.40	4.25	3.35	9.69
Subtotal	**5,500**	**1,565**	**899**	**437**	2,050
Non-Residential Demand					
Precinct 5 – Commercial	450	114.85	39.12		167.71
Precinct 6 School	30	7.66	2.61		11.18
SSPP Club	75	19.14	6.52		27.95
SSPP Child Care	9	2.30	0.78		3.35
Open Space			160.38	160.38	
Subtotal	**564**	**144**	**209**	**160**	**210**
Total	**6,064**	**1,709**	**1,108**	**632**	**2,260**

The proposed sewerage collection system for the entire development will consist of a pressurised duplex sewer system with computer controls managing the operation, flow and alarms from the individual duplex pump units throughout the network. Due to the system being pressurised it has been assumed that there shall be no additional net ingress of groundwater or infiltration inflow (I&I) that will occur like in a traditional gravity sewer system, however it is NWS policy that a nominal daily volumetric allowance for (I&I) of 10% is assumed for all schemes, which has been included in the daily waste water generation figures. The (I&I) assumptions have been approved for use by Sydney Water and EPA NSW on other schemes.

Table 12 – Average Annual Total Development Demands

Annual Total Development Demand					
Precinct	**No. of ET**	**Drinking Water Demand (kL/pa)**	**Total Recycled Water Demand (kL/pa)**	**External Recycled Water Demand (kL/pa)**	**Wastewater Generation – Includes 10% I&I (kL/pa)**
Residential Demand					
P1	338	35,113	20,155	9,769	45,979
P2	560	58,177	33,394	15,849	76,176
P3	211	21,918	12,582	6,290	28,704
P4	40	4,154	2,387	1,607	5,442
P6	307	31,894	18,308	8,920	41,760
P7	656	68,149	39,121	18,479	89,235
P8	339	35,219	20,217	9,796	46,114
P9	442	45,917	26,357	12,617	60,123
P10	437	45,399	26,061	12,480	59,444
P11	305	31,686	18,188	8,865	41,490
P12	439	45,607	26,178	12,535	59,718
P13	578	60,046	34,467	16,342	78,625
P14	157	16,312	9,362	4,811	21,356
P15	234	24,309	13,954	6,920	31,832
P16	266	27,634	15,863	7,797	36,182
P17	165	17,140	9,840	5,030	22,444
SSPP Balance	26	2,701	1,551	1,223	3,537
Subtotal	**5,500**	**571,375**	**327,985**	**159,330**	**748,159**
Non-Residential Demand					
Precinct 5 – Commercial	450	41,920	14,279		61,214
Precinct 6 School	30	2,796	953		4,081
SSPP Club	75	6,986	2,380		10,202
SSPP Child Care	9	840	285		1,223
Open Space 20ha				58,537	
Subtotal	**564**	**52,542**	**76,433**	**58,537**	**76,719**
Total	**6,064**	**623,916**	**404,418**	**217,867**	**824,878**

5 Recycled Water Production

The recycled water for the proposed development shall be sourced from the on-site MBR Waste Water Treatment Plant which will collect and treat all waste water generated within the development. The treated waste water permeate will be to Class A standard from the MBR Waste Water Treatment Plant. The Class A Permeate will then pass through the AWTP to produce Class A+ recycled water for domestic reuse. The MBR and AWTP system also includes a 4 ML storage reservoir and variable speed pump station designed to buffer the demand requirements for the development recycled water network.

During the MBR and AWTP processing there will be some system losses through waste generation by the MBR WWTP Permeate that is generated as a result of the treatment process, these losses are shown in Table 13 below.

5.1 Recycled Water Generation

The volume of recycled water that will be available for reuse within the development is summarised in the table below.

Table 13 – Recycled Water Generation from MBR WWTP

Flows at MBR WWTP							
WWTP Waste Generation Rate	Ave. Daily Wastewater Generation (kL/Day)	Ave. Daily WWTP Waste Generation (kL/Day)	Annual Wastewater Generation (kL/pa)	Annual WWTP Waste Generation (kL/pa)	Ave. Daily Volume of Recycled Water Generated (kL/d)	Ave. Daily Flow Rate Recycled Water Generated (L/s)	Annual Volume of Recycled Water Generated (kL/pa)
-2.0%	2,260	-45	824,878	-16,498	2,215	25.64	808,380

5.2 Recycled Water Balance

There will be excess recycled water generated through the treatment process that will be reused offsite by other non-residential consumers. The recycled water balance is summarised in the table below.

Table 14 – Recycled Water Balance

Recycled Water Balance		
Daily Volume of Recycled Water Generated (kL/d)	Daily Volume of Recycled Water Consumed Within Development (kL/d)	Daily Excess Recycled Water for other uses (kL/d)
2,215	1,108	1,107

6 Cobaki Integrated Water Scheme Water Balance

The water balance for the average daily performance of the Cobaki integrated water scheme based on full development yield is summarised in the table below.

Table 15 – Summary of Cobaki Integrated Water Scheme Average Daily Flows

Cobaki Integrated Water Scheme Average Daily Flows (kL/Day)							
Total Drinking Water	Total Wastewater Generated	WWTP Waste Generation	Recycled Water Generated	Development Recycled Water Internal Demand	Residential External Water Use	Public Space Irrigation	Offsite Recycled Water Demand
1,709	2,260	-45	2,215	1,108	437	160	1,107

7 Integration with Tweed Shire Council

The Cobaki Integrated Water Scheme shall have some interconnection with Tweed Shire Council's (TSC) existing drinking water and sewerage system under agreement between the parties downstream of the proposed Cobaki development.

It is proposed to utilise TSC's drinking water supply network to provide the drinking water into the proposed development. The drinking water will be supplied into the development via a metered connection point, where it shall be transferred and discharged into storage reservoirs for distribution within the site by NWS.

In order to provide redundancy within the recycled and wastewater treatment system it is proposed to construct a metered discharge rising main to a new sewerage pump station (Provided by others) connected to the existing Tweed Shire Council sewerage system. The purpose of this connection would be to facilitate discharge of the WWTP excess permeate and excess recycled water during wet weather events.

In order to determine the impact of these connections on TSC's existing system the flow rates have been calculated to reflect and presented as Equivalent Tenements based on the NSW Water Directorates – Section 64 Determinations of Equivalent Tenements Guidelines.

7.1 Drinking Water Equivalent Tenement Demand

The table below summarises the estimated Equivalent Tenements for Drinking Water for Tweed Shire Council based on the proposed Cobaki Integrated Water Scheme daily water demand. As the water supply is to discharge into a storage reservoir it has been assumed that the total daily demand will be supplied over a 22 hr period.

Table 16 – Drinking Water TSC Equivalent Tenement Demand

Drinking Water Demand - Tweed Shire Council Equivalent ET Demand					
Daily Drinking Water Demand (kL/d)	**Average Demand Flow Rate (24hr Fill Time) (L/s)**	**Annual Drinking Water Demand (ML/PA)**	**TSC (EP/ET)**	**NSW Water Directorate Standard ET Consumption PA (kL/PA)**	**Equivalent TSC ET**
1,709	19.78	623.785	2.8	230	**2,713**

7.2 Excess Sewer Discharge Equivalent Tenement Calculation

The volume of excess water that may be discharged into the existing TSC system has been calculated based on the daily residential external and offsite reuse requirements. During a wet weather event it is assumed that no external residential water usage will occur and only 50% of the offsite reuse will be required. The annual Public Open Space irrigation volume has been calculated to accommodate for wet days where no irrigation is to occur and therefore does not need to be considered in the daily excess volume.

Based on the total average number of wet days in a year a yearly discharge demand has been calculated for the excess water that may require discharge to TSC's sewer.

This volume has been calculated to estimate the total number of Equivalent Tenements for Tweed Shire Council for sewer as summarised in the table below.

Table 17 – Summary of Daily External Recycled Water Reuse

Summary of Daily External Recycled Water Reuse Not Required on Wet Days		
Daily Residential External Reuse Volume (kL/Day)	50% of Offsite Recycled Water Use (kL/Day)	Total Wet Day Excess External Recycled Water (kL/Day)
437	554	991

Table 18 – Recycled/Wastewater Excess Discharge TSC Equivalent Tenement Demand

Recycled/Wastewater Excess Discharge to TSC Sewer - Tweed Shire Council Equivalent ET Demand								
Total Wet Day Excess External Recycled Water (kL/Day)	Average No of Wet Days PA	Average Day Excess (kL/day)	Annual WWTP Waste Excess (kL/PA)	Total Annual Excess Discharge to TSC Sewer (ML/PA)	Max. Waste Water Discharge Flow Rate (L/s)	TSC Ave. Tenement (EP/ET)	NSW Water Directorate Standard ET WW Generation kL/PA	Equivalent TSC ET
991	132	518.4	(16,498)	172,718	6	2.8	140	**1,233.7**

8 Conclusion

Based on the findings of this water balance report NWS would need to enter into agreements with TSC for the supply of Emergency Waste Water Discharge and Drinking Water Supply for the Cobaki Integrated Water Supply Scheme.

8.1 Emergency Waste Water Discharge

Based on the findings of the water balance in the event of a significant wet weather event the ability to discharge excess recycled water may be required. In order to provide a suitable level of redundancy into the system NWS require there to be suitable back up discharge options available to cater for the worst case operating scenario. Based on this requirement the emergency waste water discharge agreement would need to cater for the following:

- Provide access to discharge a maximum daily volume of treated waste water of 518.5 kL/Day
- Discharge to the metered discharge point at the new TSC SPS at Cobaki Parkway and Sandy Road roundabout of no more than 6 l/s
- Annual discharge cap of 173 ML/PA

8.2 Drinking Water Supply

In order to provide potable drinking water into the proposed development NWS are seeking to obtain drinking water from TSC to fill onsite potable water storage tanks, via a Drinking Water Supply Agreement with TSC. Based on the water balance assessment the supply agreement would need to cater for the following:

- Provide a maximum of a daily supply volume of 1,707 kL/Day
- Delivery at a minimum flow rate of 19.8 l/s over 24 hours
- Annual drinking water supply cap of 623.785 ML/PA

8.3 Summary of Equivalent Tenements

The total number of equivalent tenements for Water and Sewer are summarised in the table below.

Table 19 – Summary of Equivalent Tenements

Water Supply ET	Sewerage Discharge ET
2,712.2	**1,233.7**

8.4 Boundary Conditions Report

In addition to the water balance report NWS will provide a boundary conditions report which will detail the responsibilities of the stake holders (NWS, TSC & LM) involved which shall include but not be limited to:

- A scope of works required by each stakeholder is to be included in a tri party agreement
- Demarcation lines of responsibility to be included in the draft agreements
- Developer Charges by TSC that will apply per lot to NWS for providing drinking water and access to sewerage
- Fees and charges that will apply
- Metering fees PA
- Address any regulatory requirements

Appendix 4.1.6B. Copy of TSC Letter

Council Reference:
Your Reference:

TWEED SHIRE COUNCIL

25 July 2016

Customer Service | 1300 292 872 | (02) 6670 2400

tsc@tweed.nsw.gov.au
www.tweed.nsw.gov.au

Fax (02) 6670 2429
PO Box 816
Murwillumbah NSW 2484

Please address all communications to the General Manager

ABN: 90 178 732 496

Mr Wayne Williamson
Northern Water Solutions
PO Box 977
NOOSA HEADS QLD 4567

Via email to: wayne@northernwatersolution.com

Dear Wayne

Provision of Water and Sewerage Services to Cobaki

In discussions between Northern Water Solutions (NWS) at Council's Tweed offices on 31 May 2016 NWS sought a letter from Council indicating that it was feasible for Council to provide bulk water and receive treated wastewater from an operator, licensed under the Water Industry Competition Act 2006, of water and sewerage infrastructure at the Cobaki development.

On 21 July 2016 Council resolved to issue a letter to NWS advising NWS that it is technically feasible for Council to provide bulk water and receive treated wastewater from NWS for the Cobaki development, subject to:

1. Determining the impact on Council's infrastructure;
2. Developing an agreement which ensures Council is not disadvantaged; and
3. A further resolution of Council approving the negotiated agreement.

It should be noted that to enable this to occur there is a need for additional Council infrastructure to supply the bulk water and accept the treated wastewater from the development.

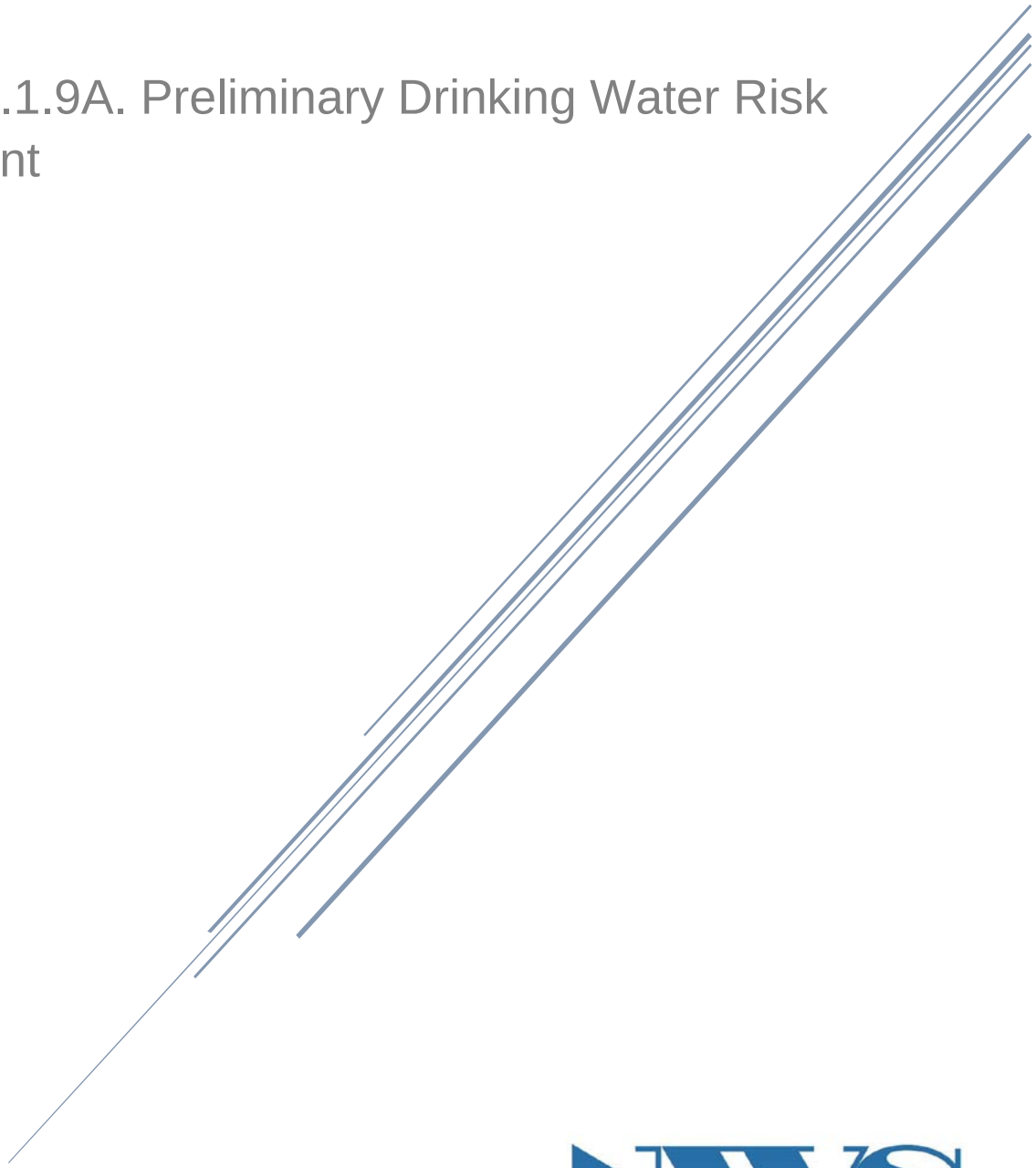
The intent of this letter, as requested by Northern Water Solutions, is to inform the Independent Pricing and Regulatory Tribunal that it is technically feasible for Council to provide bulk water to and receive bulk wastewater from a licenced operator at the Cobaki development. The letter is not a commitment to do so as any such commitment would require a resolution of Council after consideration of a proposed agreement between Northern Water Solutions and Tweed Shire Council.

If you have any enquiries in respect to this matter please contact Rob Siebert at Tweed Shire Council at rsiebert@tweed.nsw.gov.au.

Yours faithfully

David Oxenham
DIRECTOR ENGINEERING

Appendix 4.1.9A. Preliminary Drinking Water Risk Assessment



Project **Cobaki Estate Development**
Client Leda Manorstead
Title Drinking Water Preliminary Risk Assessment for IPART Application
Author WW
Date (Revision) 08/08/2016 (Revision C)
Risk Criteria As per Tables 3.1, 3.2 & 3.3: Australia Drinking Water Guidelines 6 (2011)

Appendix 4.1.9

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequences		Risk		Likelihood		Consequences		Risk
Drinking Water Supply	Contaminants in the drinking water from the source	Contaminants detected by Tweed Shire Councils monitoring systems	Supply of non-compliant drinking water	D	Unlikely	3	Moderate	High	1. The drinking water supply agreement from Tweed Shire Council guarantees drinking water supply will be compliant with the Australian Drinking Water Guidelines. The Tweed Shire Council is responsible for all upstream management of the catchments, water treatment and monitoring the drinking water quality upstream of the NWS connection point. 2. TSC & NWS are to develop notification and communication protocols with each other to notify any water quality events that may occur in a timely manner.	D	Unlikely	3	Moderate	Moderate
Drinking Water Rising main from the TSC existing network to the NWS connection point	Oil and pump lubricants	Water supply contaminated with oil/lubricant from failed pump seal	Supply of non-compliant drinking water	E	Rare	2	Minor	Low	1. Appropriate pump selection and design. 2. Routine inspection and maintenance of transfer pump station	D	Unlikely	2	Minor	Low
	Transfer Pump Station Failure	Mechanical, electrical or control system failure or power outage	Loss of supply capacity to TSC Reservoir	D	Unlikely	3	Moderate	High	1. Multiple pump set with standby capacity 2. 24 hours storage provided in Existing TSC water storage Reservoirs and 72 hours in the NWS storage tanks	D	Unlikely	2	Minor	Low
Drinking Water Transfer Pipeline from the TSC connection point to the NWS storage tanks at the WWTP site	Microbiological contamination	Water main break	Supply of non-compliant drinking water	C	Possible	4	Major	Very High	1. Design, construction, pressure testing and commissioning of the transfer main to WSAA Standards. 2. Emergency Response Plan to be developed for water main breaks will include water main sterilization procedures	D	Unlikely	3	Moderate	Moderate
	Microbiological contamination	Cross contamination due to poor maintenance practices	Supply of non-compliant drinking water	D	Unlikely	3	Moderate	High	1. Standard operating and maintenance procedures will be developed for the scheme. Procedures will include water main flushing, hygiene and disinfection requirements. 2. Transfer drinking water main is a dedicated pipeline.	E	Low	2	Moderate	Low
	Microbiological contamination	Backflow and cross connections	Supply of non-compliant drinking water	E	Rare	2	Moderate	Moderate	1. No direct connections to the transfer pipeline. The only connection point to the pipeline is the onsite drinking water storage tanks via a 300 mm air gap.	E	Unlikely	2	Minor	Low
	Sedimentation in pipeline	Excessive sedimentation in pipeline during off peak periods	Taste, odor and color complaints	E	Rare	2	Minor	Moderate	1. Undertake routine flushing of the water transfer main 2. Customer taste and odor complaint monitoring system with Customer Service.	E	Unlikely	1	Insignificant	Low

Project **Cobaki Estate Development**
Client Leda Manorstead
Title Drinking Water Preliminary Risk Assessment for IPART Application
Author WW
Date (Revision) 08/08/2016 (Revision C)
Risk Criteria As per Tables 3.1, 3.2 & 3.3: Australia Drinking Water Guidelines 6 (2011)

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	Pipeline breakage	Major pipeline breakage	Localized flooding, soil erosion, loss of supply	C	Possible	4	Major	Very High	1. If a break or damage occurs in the existing 375 mm main it will be repaired, air scoured, disinfected and pressure tested before being put back into service. 2. Covered by construction quality assurance. 3. Flow monitoring at each end of the pipeline to detect flow differential. 4. 72 hours 8ML of storage is provided in onsite drinking water storage tanks. 5. Emergency Response Plan for drinking water main breaks. 6. Frequent inspection along water main corridor to detect leaks and breaks.	B	Likely	3	Moderate	High
	Pipeline leakage	Minor leaks	Water wastage	B	Likely	2	Minor	High	1. Use VSD controlled transfer pump station to minimize operating pressure during low flows. Pumps will only ramp up to maximum pressure when pumping peak flows. 2. Flow meters and pressure sensors on the transfer pipeline for monitoring of "midnight flows" for identification of leaks. 3. Walk over and visual inspection along water main corridor to identify leaks. 4. Use leak detection equipment if required.	B	Likely	1	Insignificant	Moderate
Vermin, animal and mosquito access to storage	Microbiological contamination	Vermin, animal and mosquito access to storage	Supply of non-compliant drinking water	D	Unlikely	2	Minor	High	1. Sealed tank designed to drinking water storages with screens on all tank openings. 2. Ongoing inspection & maintenance program	D	Unlikely	2	Minor	Low
	Material compatibility	Dissolution of tank materials into drinking water supply	Supply of non-compliant drinking water	D	Unlikely	2	Minor	High	1. Tank to be constructed to drinking water storage standards using materials compatible with drinking water supply 2. Metallic tanks to use food grade HDPE liner.	D	Unlikely	2	Moderate	Moderate
	Cross connection	Backflow into dedicated drinking water transfer main	Supply of non-compliant drinking water	D	Unlikely	3	Moderate	High	1. Connection of transfer main uses an Air gap above the high water overflow level in the drinking water storage tanks	E	Rare	3	Moderate	Moderate
Recirculation & Chlorine Dosing	Chlorine residual	Inadequate chlorine residual (low or high)	Supply of non-compliant drinking water	C	Possible	3	Moderate	High	1. Continuous online monitoring of free chlorine residual with alarms for low and high concentrations. 2. Duty/Standby chlorine dosing pumps with low level drum storage alarm.	D	Unlikely	3	Moderate	Low

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									3. Fault detection and alarms on dosing pumps.					
Drinking Water Supply Variable Speed Pump Station	Pump seals and lubricants	Water supply contaminated from failed pump seal	Supply of non-compliant drinking water	C	Possible	2	Minor	Moderate	1. Appropriate pump selection and design. 2. Routine inspection and maintenance of drinking water variable speed pump stations.	D	Unlikely	2	Minor	Low
	Low pressure	Water pressure in the drinking water network below that in the recycled water networks	Increased risk of backflow if a cross connection occurs	B	Likely	4	Major	Very High	1. Duty of drinking water supply pump stations are to be set at a minimum of 50 KPA above duty of the recycled water pump stations. 2. Monitoring of water pressure differential between the drinking water recycled water networks.	C	Possible	4	Major	High
	Booster pump station failure	Mechanical, electrical or control system failure or power outage	Loss of supply capacity	C	Possible	4	Major	Very High	1. VSD pressure booster pump set with standby capacity. 2. Routine inspection and maintenance of booster pump station. 3. Standby emergency diesel pump with automatic changeover	C	Possible	4	Major	High
Drinking Water Reticulation Networks	Class A+ recycled water network	Cross connection with the Class A+ recycled water network	Supply of non-compliant drinking water	C	Possible	4	Major	High	Cross connection controls including: 1. Reticulation networks designed, constructed and commissioned to WSAA standards, AS3500 & the plumbing code of NSW. 2. Using different piping color and materials. Drinking water to use blue PVC pipe. Class A+ recycled water networks to use, lilac striped HDPE pipe, lilac color water meters and taps. 3. Color piping Identification, identification tape labelling and minimum separation distances in common trenches. 4. Only approved NWS contractors can undertake work on the reticulation networks. 5. The drinking water network to operate a minimum of 50 KPA above that in the recycled water network. 6. Routine monitoring of drinking water quality 7. Monitoring of pressure and salinity differential between the drinking and recycled water networks.	B	Likely	3	Moderate	High
	Sedimentation and slime growth	Excessive sedimentation in reticulation networks during off peak periods	Taste, odor and color complaints	D	Unlikely	1	Insignificant	Low	1. Routine monitoring and water main flushing program to be put in place. 2. Monitoring of taste and odor complaints through customer service processes.	D	Unlikely	1	Insignificant	Low
	Microbiological	Drinking water main	Supply of non-	C	Possible	4	Major	Very High	1. Design, construction, pressure testing and	D	Unlikely	3	Moderate	Moderate

	contamination	break	compliant drinking water						commissioning to WSAA Standards, AS3500 & Plumbing Code NSW. 2. Emergency Response Plan for drinking water main breaks will include water main disinfection procedures					
	Microbiological contamination	Cross contamination due to poor maintenance practices	Supply of non-compliant drinking water	D	Unlikely	3	Moderate	High	1. Standard operating and maintenance procedures will be developed for the scheme. Procedures will include hygiene and disinfection requirements. 2. Separate tools to be used on drinking water and sewerage systems.	D	Unlikely	3	Moderate	Moderate
	Microbiological contamination	Backflow and cross connections	Supply of non-compliant drinking water	C	Possible	2	Minor	Moderate	1. No direct connections to the transfer pipeline. The only connection to the pipeline is at the onsite drinking water storage tanks via an 300mm air gap.	D	Unlikely	2	Minor	Low
	Reticulation pipe breakage	Major breakage	Localized flooding, soil erosion, loss of supply	C	Possible	3	Moderate	High	1. Design, construction, pressure testing and commissioning to WSAA Standards, AS3500 & Plumbing Code NSW. 2. Emergency Response Plan for drinking water main breaks will include a drinking water main disinfection procedure	C	Possible	3	Moderate	High
	Reticulation pipe leakage	Minor leaks	Drinking water wastage	C	Possible	2	Minor	Moderate	1. Use VSD controlled pump stations with a jacking pump to minimize operating pressure during low flows. 2. Flow meters and pressure sensors on reticulation networks for monitoring of "midnight flows" for identification of leaks. 3. Walk over and visual inspection along water main corridors and easements to identify leaks. 4. Use leak detection equipment if required.	C	Possible	1	Insignificant	Low
	Fire hydrants on the Drinking water network	Reduction in water pressure in drinking water network during fire flows	Increased risk of backflow if a cross connection occurs	B	Likely	4	Major	Very High	1. Cross connection controls. 2. Network design to minimize pressure losses during fire flow events. 3. Use the VSD controlled pump stations to ramp up to maintain pressure during fire flows.	C	Possible	3	Moderate	High
Customer Consumption and Private Water Systems	Onsite Class A+ recycled water pipes	Cross connection on private land	Supply of non-compliant drinking water	B	Likely	4	Major	Very High	1. Domestic plumbing systems installed and tested to comply with AS3500 and the NSW Code of Practice for Plumbing and Drainage by licensed plumbing contractors. 2. Each customer when applying for a drinking water connection must provide a cross flow connection test certificate as required by the Department of Fair Trading	C	Possible	4	Major	Very High

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									NSW before NWS will issue and install a drinking water meter to the customer. 2. NWS to provide induction, training and compliance auditing for all domestic plumbing contractors. 3. Dual check valve for backflow prevention at all meter connection points.					
	Excessive drinking water use	Poor user behavior	Excessive water use, Potential overload of onsite water systems	C	Possible	3	Moderate	High	1. Customer supply and trade waste agreements will outline expected water consumptions rates. 2. Ongoing customer awareness and education 3. Smart water meters at all connection points to provide feedback on water use	C	Possible	3	Moderate	High
	Leaks	Leaks in onsite water systems	Water wastage	B	Likely	1	Insignificant	Moderate	1. Smart water meters at all connection points to enable detection of leaks by residents	C	Possible	1	Insignificant	Low

DRINKING WATER

QUALITATIVE ENVIRONMENTAL AND PUBLIC HEALTH RISK ASSESSMENT CRITERIA

From Tables 3.1, 3.2 & 3.3 on Page 3-8 of the Australian Drinking Water Guidelines (2011)

Qualitative Measures of Likelihood

Level	Descriptor	Example Description from ADWG
A	Almost certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur or should occur at some time
D	Unlikely	Could occur at some time
E	Rare	May occur only in exceptional circumstances

Qualitative Measures of Consequence or Impact

Level Descriptor	Descriptor	Example Description from ADWG
1	Insignificant	Insignificant impact, little disruption to normal operation, low increase in normal operation costs
2	Minor	Minor impact for small population, some manageable operation disruption, some increase in operating costs
3	Moderate	Minor impact for large population, significant modification to normal operation but manageable, operation costs increased, increased monitoring
4	Major	Major impact for small population, systems significantly compromised and abnormal operation if at all, high level of monitoring required
5	Catastrophic	Major impact for large population, complete failure of system

Qualitative Risk Analysis Matrix: Level of Risk

Likelihood		Consequences				
		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Catastrophic
A	**Almost Certain**	Moderate	High	Very High	Very High	Very High
B	**Likely**	Moderate	High	High	Very High	Very High
C	**Possible**	Low	Moderate	High	Very High	Very High
D	**Unlikely**	Low	Low	Moderate	High	Very High
E	**Rare**	Low	Low	Moderate	High	High

Appendix 4.1.10A. Drinking Water Quality Plan

(Table of Contents Only)

Northern Water Solutions Pty Ltd for

Cobaki Estate Development Tweed Heads, NSW

Preliminary Drinking Water Quality Management Plan

July 2016

Appendix **4.1.10(a)**

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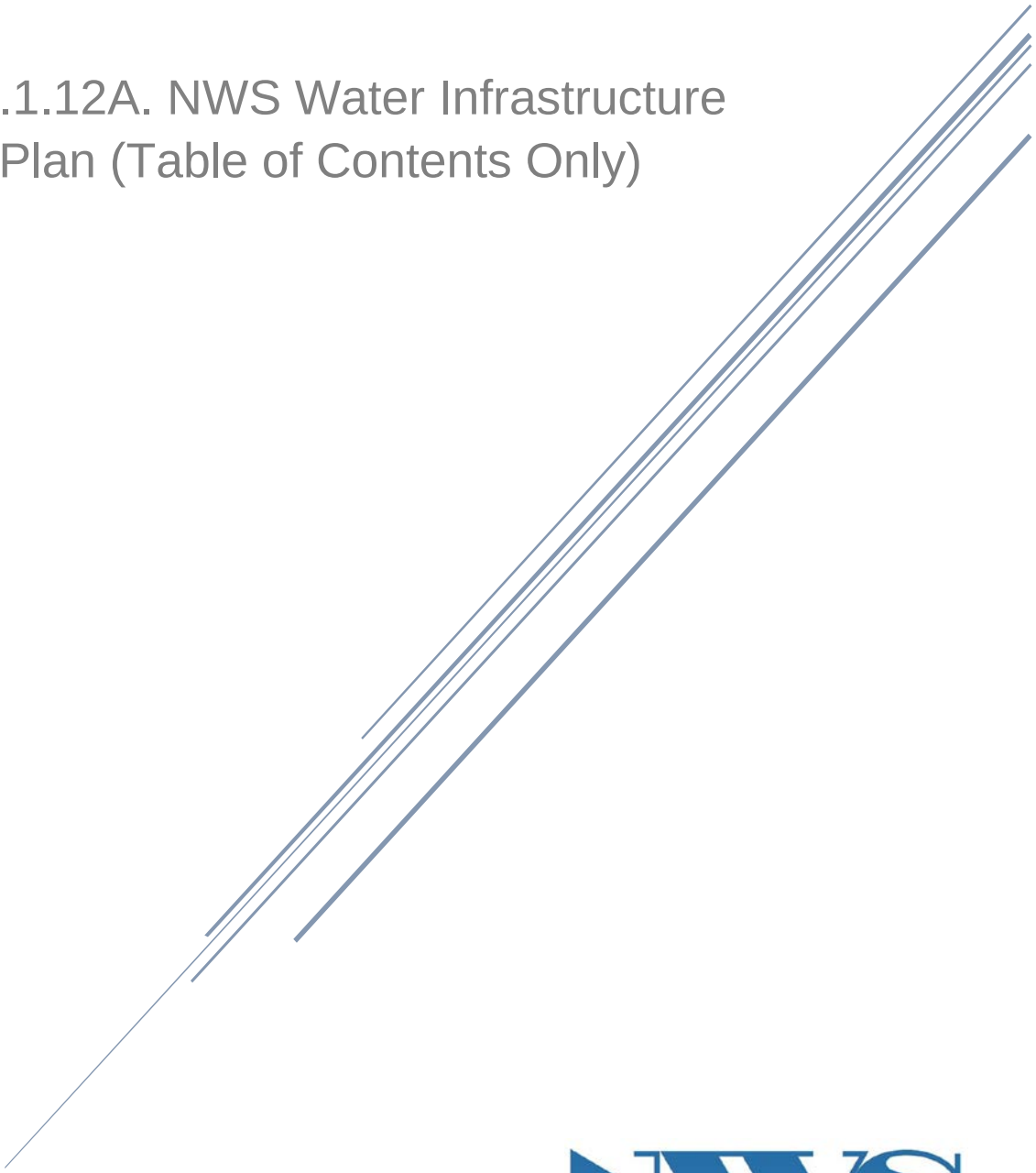
Tables

Figures

Appendices

Appendix 4.1.12A. NWS Water Infrastructure Operating Plan (Table of Contents Only)



Cobaki Estate Development Tweed Heads, NSW

Infrastructure Operating Plan

September 2016

Appendix **4.1.12A**

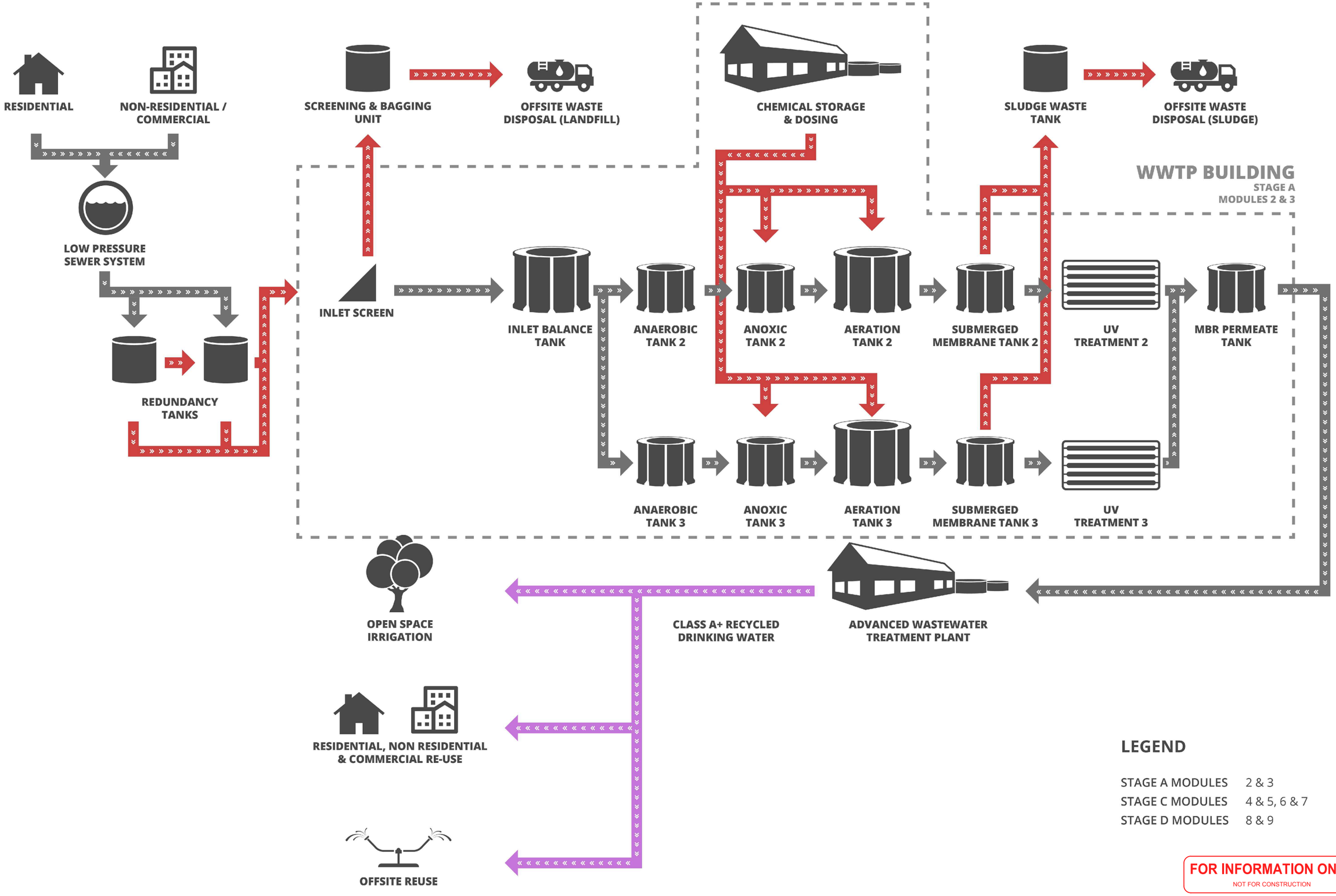
Table of Contents

Tables

Figures

Appendices

Appendix 4.2.1A. PFD Diagram



LEGEND

STAGE A MODULES	2 & 3
STAGE C MODULES	4 & 5, 6 & 7
STAGE D MODULES	8 & 9

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B	ISSUED FOR INFORMATION	25-08-2016	CW	WW	AW	

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Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429
www.wgmconsulting.com.au

CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

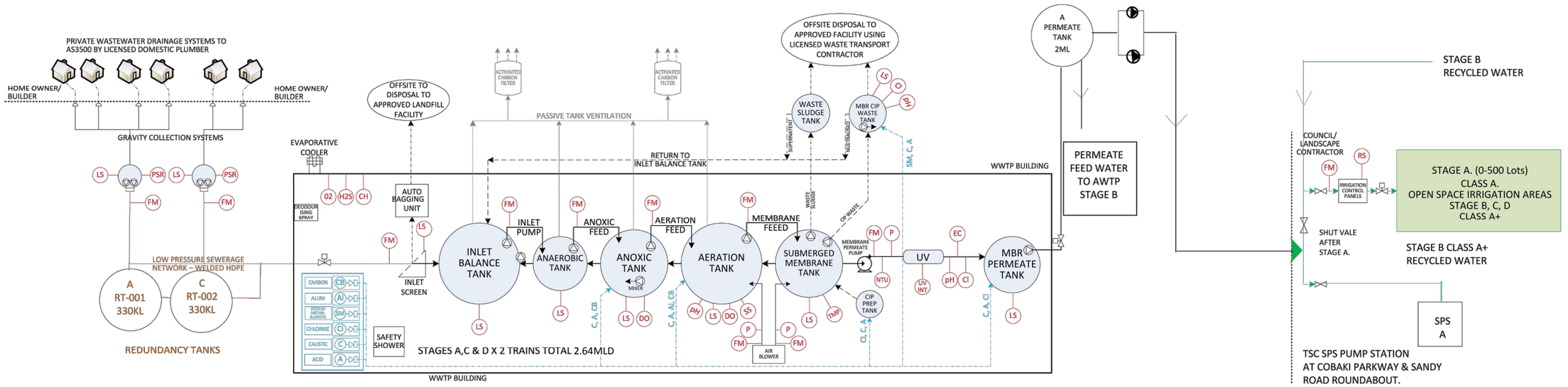
DRAWING TITLE:
WASTE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 1A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0430	C

COBAKI PROCESS FLOW DIAGRAM

STAGE A, C & D MBR WASTEWATER TREATMENT PLANT

Membrane Bioreactor Peak Design Capacity 2.64MLD



LOW PRESSURE SEWERAGE SYSTEM

- WASTEWATER WILL DRAIN THROUGH A GRAVITY SEWERAGE COLLECTION SYSTEMS TO A NUMBER OF DUPLEX LOW PRESSURE SEWAGE PUMP STATIONS THAT SERVICE 1 TO 4 LOTS EACH.
- WASTEWATER IS PUMPED IN A CONTROLLED MANNER THROUGH THE LOW PRESSURE SEWERAGE NETWORK TO THE REDUNDACY TANK AT THE WWTP. OPERATION OF THE PRESSURE SEWER NETWORK PUMPS IS CONTROLLED BY THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP TO CONTROL PEAK INFLOWS TO THE MBR.
- LOW PRESSURE SEWER NETWORK TO BE CONSTRUCTED WITH BROWN-STRIPED PN 16 HDPE PIPE WITH WELDED PIPE JOINTS AND FITTINGS.
- EACH LOW PRESSURE SEWERAGE PUMP STATION WILL INCLUDE:
  - PUMP HEAD AND FLOW CAPACITY TO SERVICE BETWEEN 1 AND 4 LOTS.
  - DUTY AND STANDBY PUMPS WITH ONLINE FAULT DETECTION AND ALARMS.
  - 24 HOURS EMERGENCY STORAGE CAPACITY IN THE WET WELL.
  - HARD WIRED COMMUNICATION CABLING BACK TO THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP.
  - CONTINUOUS ONLINE WET WELL WATER LEVEL AND FLOW MONITORING WITH ALARMS.
  - AUTOMATED SYSTEM START-UP AND RECOVERY FOLLOWING POWER OUTAGE VIA THE DIRECT DIGITAL CONTROL SYSTEM.
  - ADDITIONAL ONLINE WATER QUALITY MONITORING PROBES, E.G. PH, TDS, NTU, FOR DETECTION OF INAPPROPRIATE CHEMICAL DISPOSAL OR TRADE WASTE PRACTICES, DURING OPERATION.

STAGE A,C,& D WASTEWATER TREATMENT PLANT – MEMBRANE BIOREACTOR

- ALL WASTEWATER TREATED IN THE MEMBRANE BIOREACTOR TO PRODUCE "CLASS A" RECYCLED WATER SUITABLE FOR CONTROLLED IRRIGATION . MBR TARGET EFFLUENT QUALITY:
  - BIOCHEMICAL OXYGEN DEMAND < 10 mg/L
  - SUSPENDED SOLIDS < 10 mg/L
  - TOTAL NITROGEN < 10 mg/L
  - TOTAL PHOSPHOROUS < 0.3 mg/L
  - pH 6.5 TO 8.5
  - FAECAL COLIFORMS < 10 cfu/100 mL
- PEAK DESIGN CAPACITY OF MBR PROCESS TRAIN IS 600kL PER MODULE X4

THE ADVANCED WATER TREATMENT PLANT TO PRODUCE "CLASS A+ RECYCLED WATER" WILL BE OPERATIONAL ONCE 500 LOTS ARE CONNECTED TO THE SYSTEM IN STAGE B.

- OPERATION OF THE WWTP IS FULLY AUTOMATED AND INTEGRATED WITH OPERATION OF THE PRESSURE SEWER NETWORK TO CONTROL PEAK FLOWS INTO THE MBR USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ALL ON LINE MONITORING, CONTROL AND ALAM SYSTEM CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR LATER REVIEW AND TROUBLE SHOOTING.

STAGE A EFFLUENT MANAGEMENT SYSTEM

- AN IRRIGATION MANAGEMENT PLAN AND RECYCLED WATER MANAGEMENT PLAN WILL BE DEVELOPED FOR THE SCHEME THAT WILL OUTLINE SITE SPECIFIC IRRIGATION, ENVIRONMENTAL AND PUBLIC HEALTH CONTROL MEASURES FOR EACH IRRIGATION AREA. TYPICAL IRRIGATION CONTROLS WILL INCLUDE:
  - IRRIGATION CONTROLLERS TO CONTROL THE TIME, FREQUENCY AND DURATION OF IRRIGATION EVENTS.
  - RAIN-SENSOR OVERRIDE ON IRRIGATION CONTROLLERS AND IRRIGATION SUPPLY PUMP TO PREVENT IRRIGATION DURING OR SHORTLY AFTER RAIN.
  - SUBSURFACE IRRIGATION IN WITHIN 20 METRES OF IDENTIFIED SENSITIVE RECEPTORS.
  - SPRAY DRIFT CONTROLS ON SURFACE IRRIGATION SYSTEMS.
  - APPROPRIATE BUFFER DISTANCES TO WATERWAYS, SEPP 14 WETLANDS AND OTHER SENSITIVE RECEPTORS.
  - CROSS CONNECTION CONTROLS INCLUDING UNIQUE PIPE MATERIALS, BACKFLOW PREVENTION AND PRESSURE MANAGEMENT.
  - IRRIGATION AT NIGHT TO MINIMISE POTENTIAL FOR HUMAN CONTACT.
  - APPROPRIATE WARNING SIGNS AND IDENTIFICATION AND LABELLING.

NOTE:
DURING STAGE A. CLASS A. TREATED EFFLUENT WILL BE USED TO DEVELOP THE 20HA OF OPEN SPACE AND SPORTS FIELDS BY CONTTROLLED IRRIGATION SYSTEM. EXCESS TREATED.
EFFLUCENT DURING WET WEATHER EVENTS WILL BE DISCHARGED TO THE NEW SP5 LOCATED AT COBAKI PARKWAY & SANDY ROAD ROUNDABOUT WHICH IS CONNECTED TO THE EXISTING TSC NETWORK.
STAGE B.
RECYCLED WATER WILL BE USED ONLY ON THE OPEN SPACE & SPORTS FIELD AREA'S AND ANY EXCESS ? WILL BE DISCHARGED TO THE TSC SPS.
REFER TO THE WATER BALANCE REPORT FOR MORE DETAILS .

LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- PSR PUMP STARTS AND RUN HOURS
- LS WATER LEVEL
- DO DISSOLVED OXYGEN
- SS MIXED LIQUOR SUSPENDED SOLIDS
- pH pH
- Cl FREE CHLORINE RESIDUAL
- NTU TURBIDITY
- TMP TRANSMEMBRANE PRESSURE
- UV INT UV INTENSITY
- EC ELECTRICAL CONDUCTIVITY
- RS RAIN SENSOR
- CH METHANE GAS
- H2S HYDROGEN SULPHIDE GAS
- 02 OXYGEN GAS

PROCESS EQUIPMENT

- INLET SCREEN
- MEMBRANE BIOREACTOR PROCESS TANKS
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- HOUSEHOLD SEWERAGE CONNECTION POINT
- EVAPORATIVE AIR CONDITIONING UNIT

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- CB ACETIC ACID (CARBON) DOSING AS SUPPLEMENTARY FOOD SOURCE
- Al POLYALUMINIUM CHLORIDE DOSING FOR PHOSPHORUS REMOVAL
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

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www.wgmconsulting.com.au
CONSULTING

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NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

DRAWING TITLE:
WASTE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 1B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
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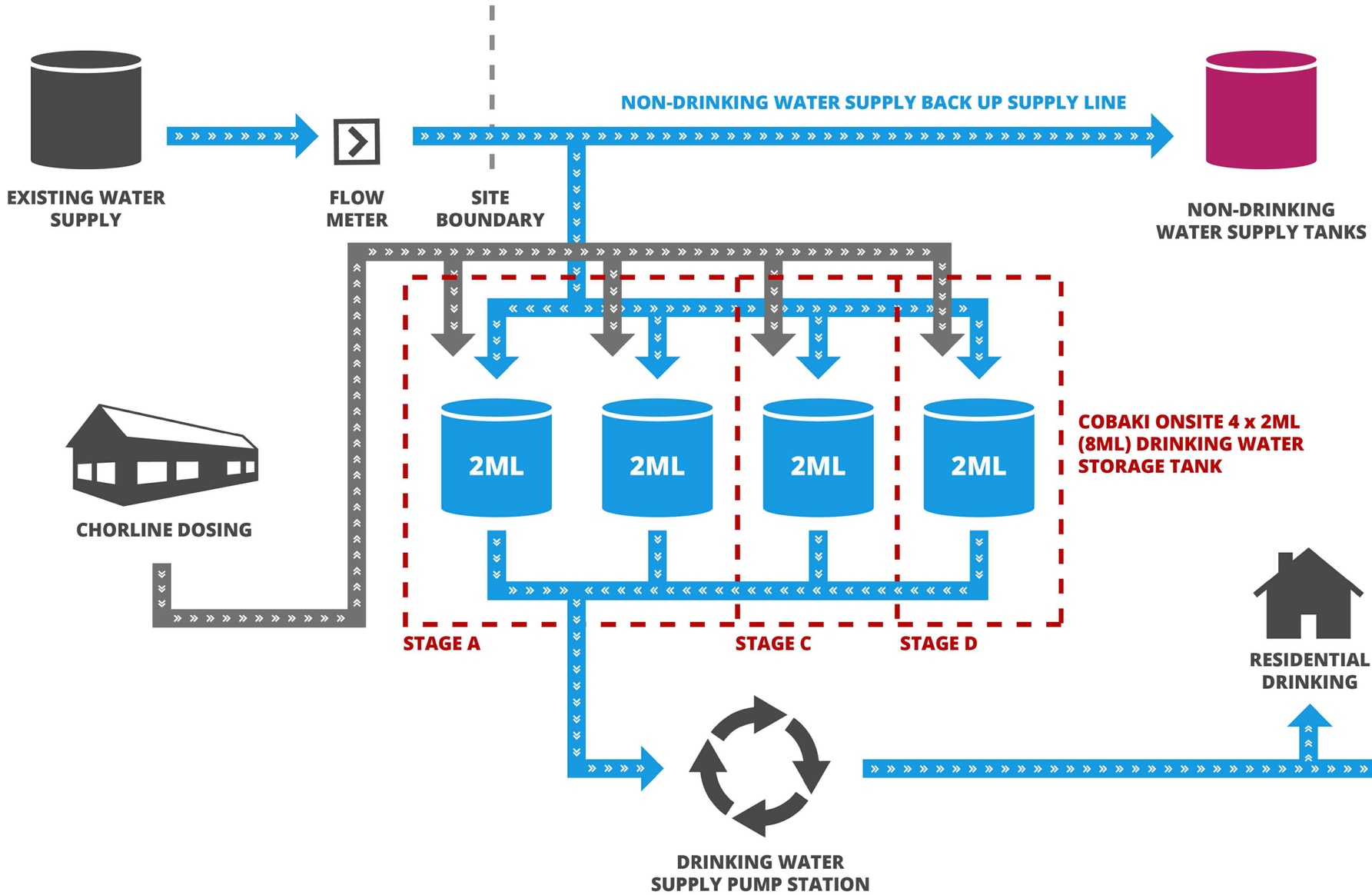

TOTAL 8ML

STAGE A - 2 x 2ML
STAGE C - 1 x 2ML
STAGE D - 1 x 2ML

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NOOSA HEADS, QLD 4567

PROJECT:
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PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

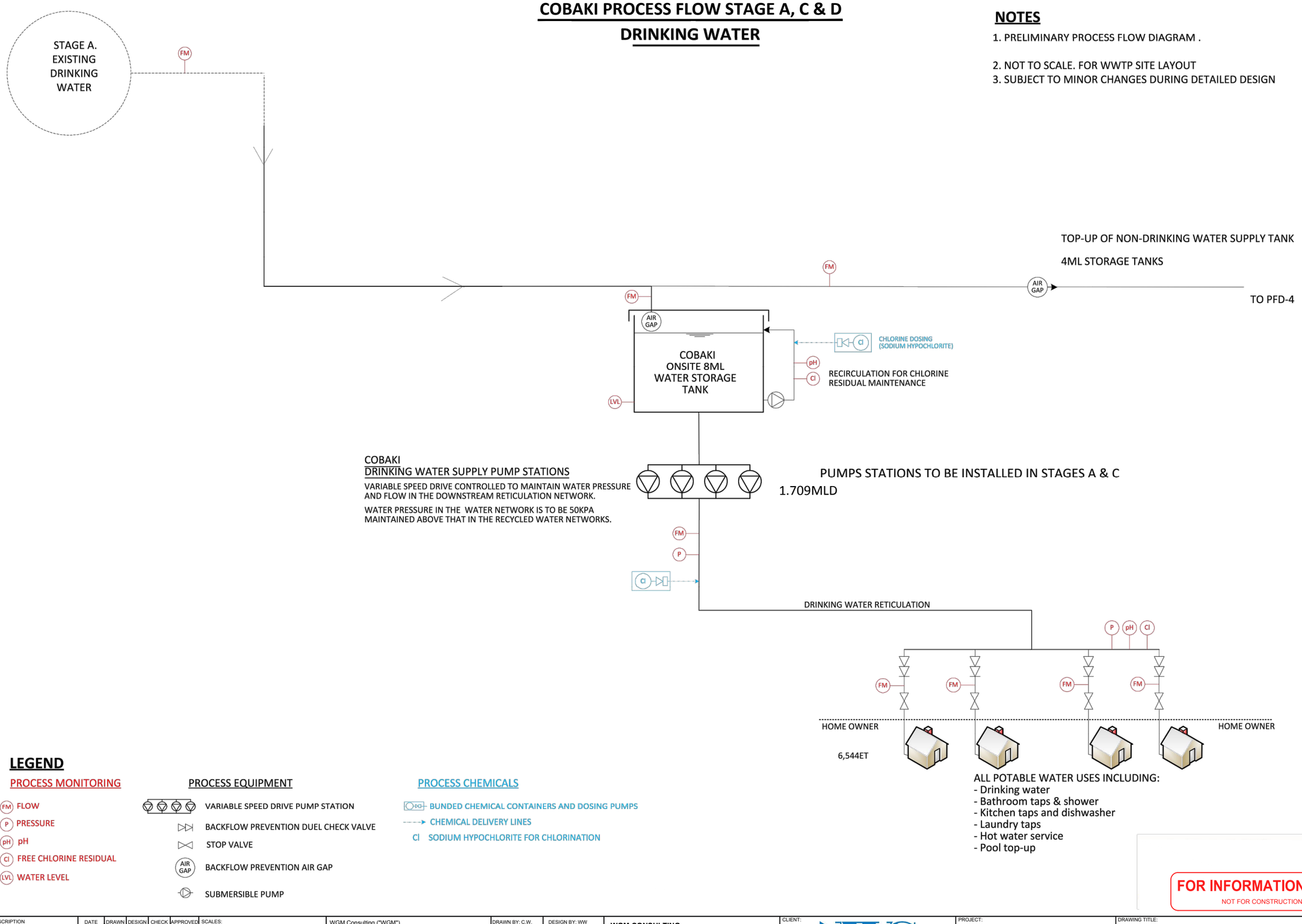
DRAWING TITLE:
DRINKING WATER
PROCESS FLOW DIAGRAM 2A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0432	C

COBAKI PROCESS FLOW STAGE A, C & D
DRINKING WATER

NOTES

1. PRELIMINARY PROCESS FLOW DIAGRAM .
2. NOT TO SCALE. FOR WWTP SITE LAYOUT
3. SUBJECT TO MINOR CHANGES DURING DETAILED DESIGN



LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- pH pH
- Cl FREE CHLORINE RESIDUAL
- LVL WATER LEVEL

PROCESS EQUIPMENT

- VARIABLE SPEED DRIVE PUMP STATION
- BACKFLOW PREVENTION DUEL CHECK VALVE
- STOP VALVE
- AIR GAP BACKFLOW PREVENTION AIR GAP
- SUBMERSIBLE PUMP

PROCESS CHEMICALS

- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION

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DRINKING WATER
PROCESS FLOW DIAGRAM 2B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
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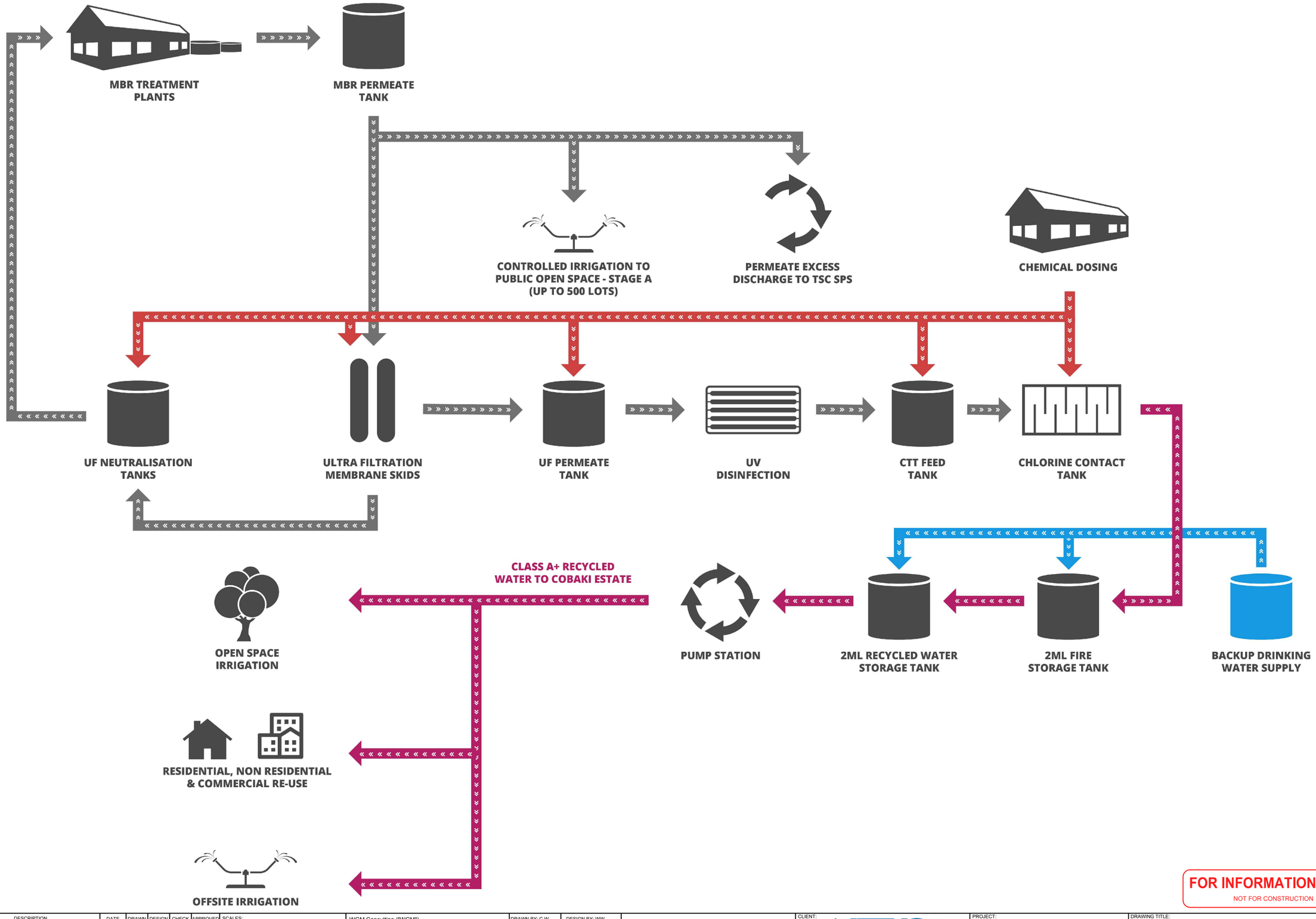

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PROJECT:

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DRAWING TITLE:

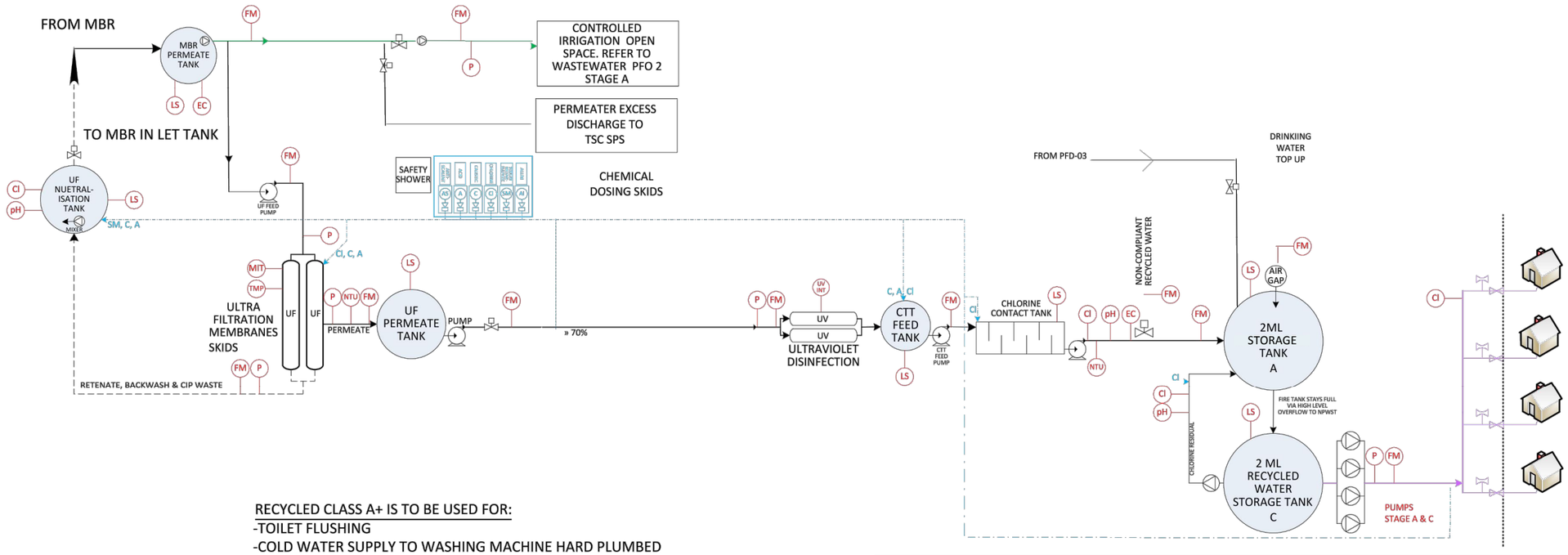
ADVANCED WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 3A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0434	C

COBAKI PROCESS FLOW DIAGRAM

STAGE B ADVANCED WATER TREATMENT PLANT

CLASS A+ RECYCLED WATER



RECYCLED CLASS A+ IS TO BE USED FOR:
-TOILET FLUSHING
-COLD WATER SUPPLY TO WASHING MACHINE HARD PLUMBED
-HOME & INDUSTRIAL WASHDOWN
-CAR WASHING
-GARDEN & LAWN WATERING
-WATER FEATURES
-OPEN SPACE AREA'S & SPORTS FIELD , GOLF COURSE
-COMMERCIAL USES NURSRIES ETC
-INDUSTRIAL COOLING TOWERS CONCRETE PRODUCTION, DUST SUSPRESSION FOR CONSTRUCTION SITES & ROAD BUILDING.

LEGEND

PROCESS MONITORING

- FM FLOW METRE
- P PRESSURE
- LS WATER LEVEL
- EC ELECTRICAL CONDUCTIVITY
- TMP TRANSMEMBRANE PRESSURE
- MIT MEMBRANE INTEGRITY TEST
- NTU TURBIDITY
- UV INT UV INTENSITY
- pH pH
- CI FREE CHLORINE RESIDUAL

PROCESS EQUIPMENT

- ADVANCED WATER TREATMENT PLANT PROCESS TANKS
- ULTRAFILTRATION MEMBRANE SKID
  NOMINAL MEMBRANE PORE SIZE 0.03 UM
  INTEGRITY TESTING BY PRESSURE DECAY
  USEPA ACCREDITED MEMBRANES SUPPLIED BY X-FLOW
- ULTRAVIOLET DISINFECTION SYSTEM
  SELF CLEANING SYSTEM WITH UV INTENSITY MONITORING
  NOMINAL UV DOSE OF 90 J/m2 @ UV TRANSMISSION OF 50%
  USEPA ACCREDITED UV DISINFECTION SYSTEM SUPPLIED BY ORICA
- CHLORINE CONTACT TANK
  CONTACT TANK WILL BE DESIGNED TO USEPA GUIDELINES TO ACHIEVE CT VALUES FOR THE REQUIRED LOG REMOVAL TARGETS.
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- MANUAL VALVE
- EVAPORATION MISTING SPRAYERS

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- AS REVERSE OSMOSIS MEMBRANE ANTISCALENT
- CI SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

STAGE B WWTP – ADVANCED WATER TREATMENT PLANT

- THE ADVANCED WATER TREATMENT PLANT (AWTP) WILL BE COMMISSIONED ONCE 500 LOTS HAVE BEEN CONNECTED TO THE SYSTEM.
- THE AWTP IS SIZED TO PRODUCE 2.4 MLDAY OF CLASS A+ RECYCLED WATER SUITABLE FOR SUPPLY IN THE DUAL RETICULATION SYSTEM FOR DOMESTIC RE-USE
- LOG REDUCTION TARGETS FOR THE AWTP BASED ON TABLE 3.7 IN THE NATIONAL GUIDELINES FOR WATER RECYCLING (EPHC: 2006) ARE:
  - BACTERIA: >5.3 LOG REDUCTION
  - VIRUSES: >6.5 LOG REDUCTION
  - PROTOZOAN: >5.1 LOG REDUCTION
- LOG REDUCTION TARGETS WILL BE ACHIEVED USING ULTRAFILTRATION MEMBRANES, ULTRAVIOLET DISINFECTION AND CHLORINE CONTACT TANK. ALL PROCESSES AND EQUIPMENT USED TO ACHIEVE LOG REDUCTION TARGETS WILL BE ACCREDITED TO USEPA GUIDELINES AND VALIDATED ONSITE PRIOR TO COMMENCEMENT OF SUPPLY OF RECYCLED WATER FOR DOMESTIC USE
- PRIOR TO COMMISSIONING AND VALIDATION OF THE AWTP DURING STAGE B DRINKING WATER WILL BE USED TO SUPPLY THE DUAL RETICULATION SYSTEM.
-
- OPERATION OF THE AWTP IS FULLY AUTOMATED AND INTEGRATED WITH THE OPERATION OF THE DUAL RETICULATION SYSTEM USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ALL ONLINE MONITORING, CONTROL AND ALARM SYSTEMS CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR REVIEW AND TROUBLE SHOOTING.
- THE AWTP IS DESIGNED TO AUTOMATICALLY SHUT DOWN IF NON-COMPLIANT RECYCLED WATER IS DETECTED THROUGH CONTINUOUS ONLINE MONITORING.
- THE NON-DRINKING WATER STORAGE TANK PROVIDES IN APPROXIMATELY 3-DAY STORAGE AT PEAK RECYCLED WATER DEMANDS. THE DUAL RETICULATION SYSTEM WILL BE SUPPLEMENTED BY A DRINKING WATER TOP-UP DURING PERIODS OF EXTENDED PEAK DEMAND IF REQUIRED

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PIGGABEEN ROAD
NSW
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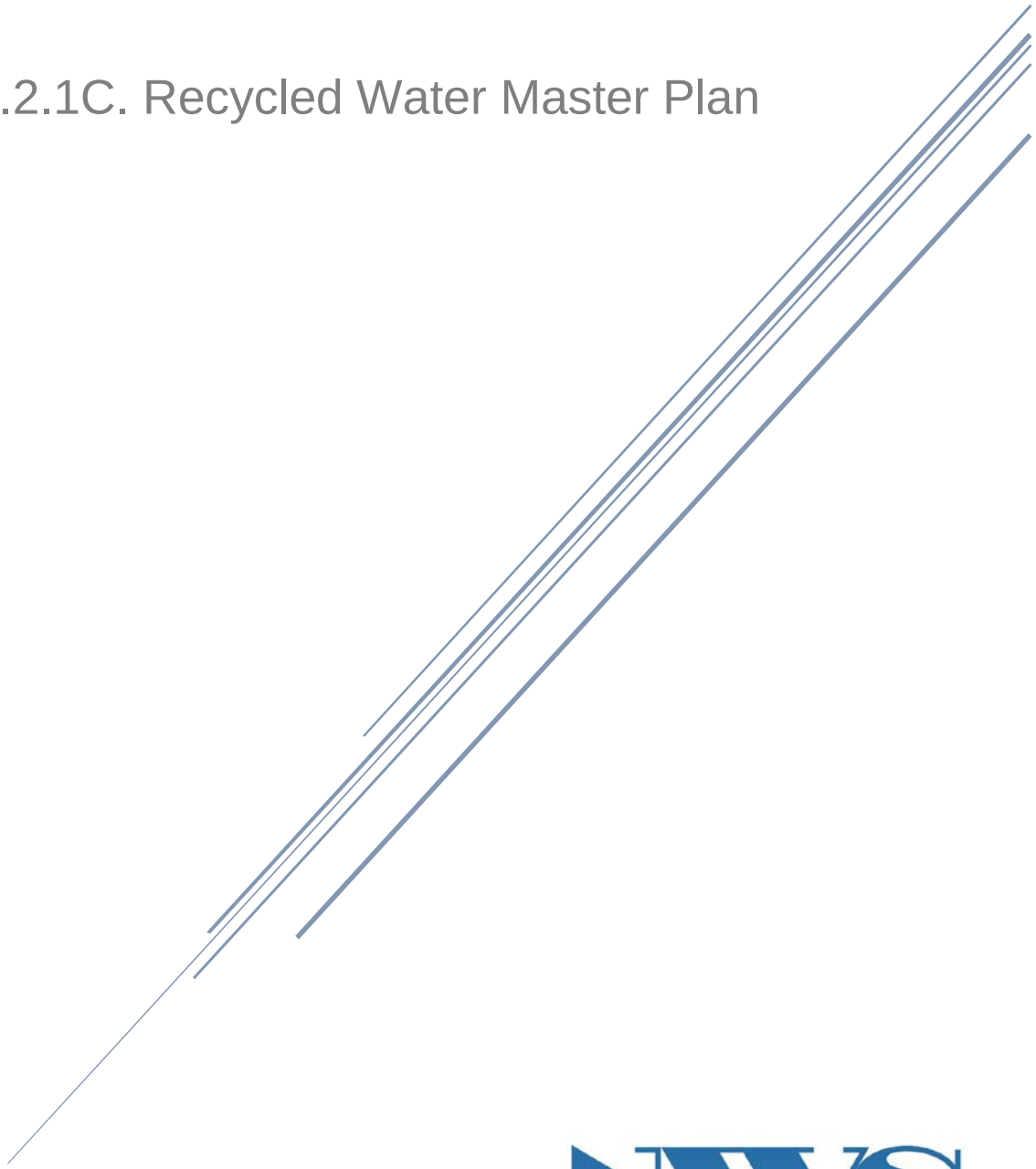
DRAWING TITLE:
ADVANCED WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 3B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0435	C

Appendix 4.2.1C. Recycled Water Master Plan



LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
- SCHOOL / UTILITIES
- OPEN SPACE
- ENVIRONMENTAL PROTECTION AREA
- COVENANT PROTECTED AREA
- STRUCTURED OPEN SPACE
- DAM
- PROPOSED COMMUNITY FACILITIES
- INDICATIVE HIGH LEVEL PRESSURE ZONE
- POTABLE WATER SUPPLY LINE
- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN

DETAIL SHEET 1

DETAIL SHEET 2

DETAIL SHEET 3

DETAIL SHEET 4

DETAIL SHEET 5

QUEENSLAND

NEW SOUTH WALES

N

WWTP SITE

INDICATIVE ZONE BOUNDARY VALVES

INDICATIVE ZONE BOUNDARY VALVES

POTENTIAL EMERGENCY OPERATIONAL INTERCONNECTION

PIGGABEEN ROAD

COBAKI CREEK

PRELIMINARY ISSUE
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PLANIT ENGINEERING
SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:

NWS
NORTHERN WATER SOLUTIONS

PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
RECYCLED WATER SCHEME
OVERALL LAYOUT

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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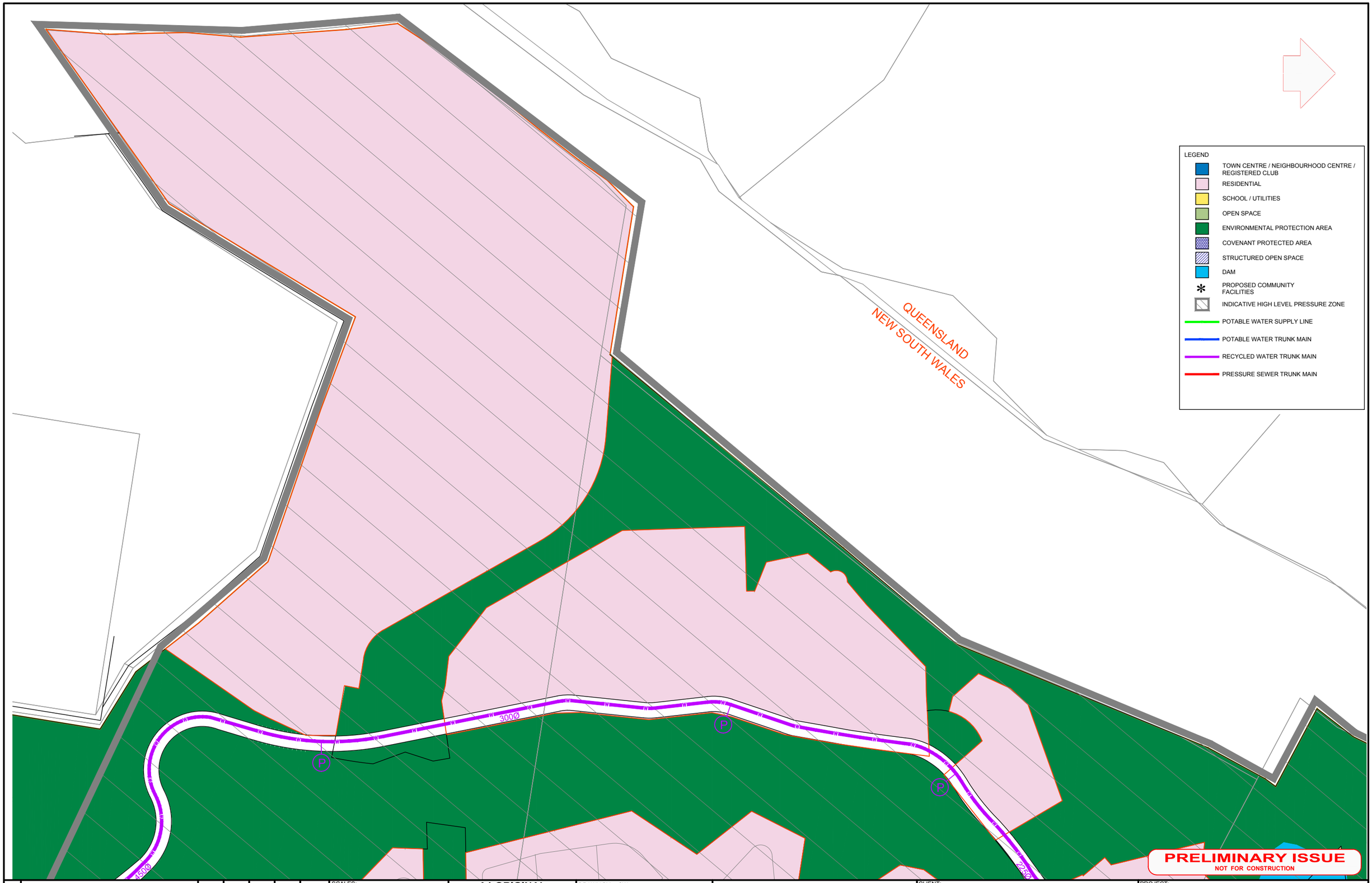

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PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:

NWS
NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
RECYCLED WATER SCHEME
DETAILED SHEET 1 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0013	B

LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
- SCHOOL / UTILITIES
- OPEN SPACE
- ENVIRONMENTAL PROTECTION AREA
- COVENANT PROTECTED AREA
- STRUCTURED OPEN SPACE
- DAM
- PROPOSED COMMUNITY FACILITIES
- INDICATIVE HIGH LEVEL PRESSURE ZONE
- POTABLE WATER SUPPLY LINE
- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN
- BOOSTER PUMP

N

INDICATIVE ZONE BOUNDARY VALVES

PRELIMINARY ISSUE
NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR INFORMATION	07-07-16	DH	-	AW	-
B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-

SCALES:

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES

DO NOT SCALE FROM DRAWING

A1 ORIGINAL

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PO BOX 161
LENNOX HEAD NSW 2478

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LOCAL GOVERNMENT AUTHORITY:
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PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
RECYCLED WATER SCHEME
DETAILED SHEET 2 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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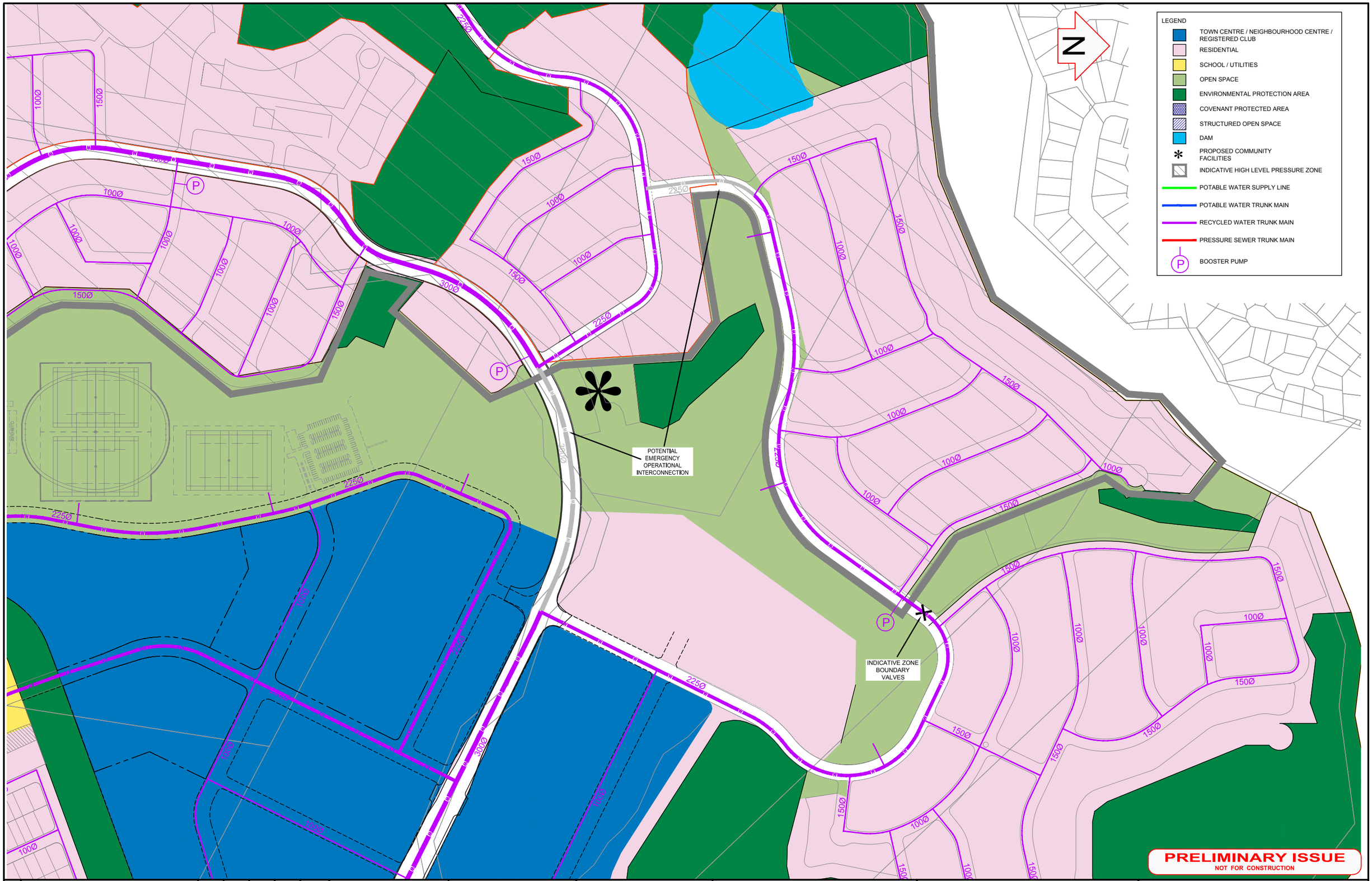

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PROJECT:
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SERVICING MASTER PLANS
RECYCLED WATER SCHEME
DETAILED SHEET 3 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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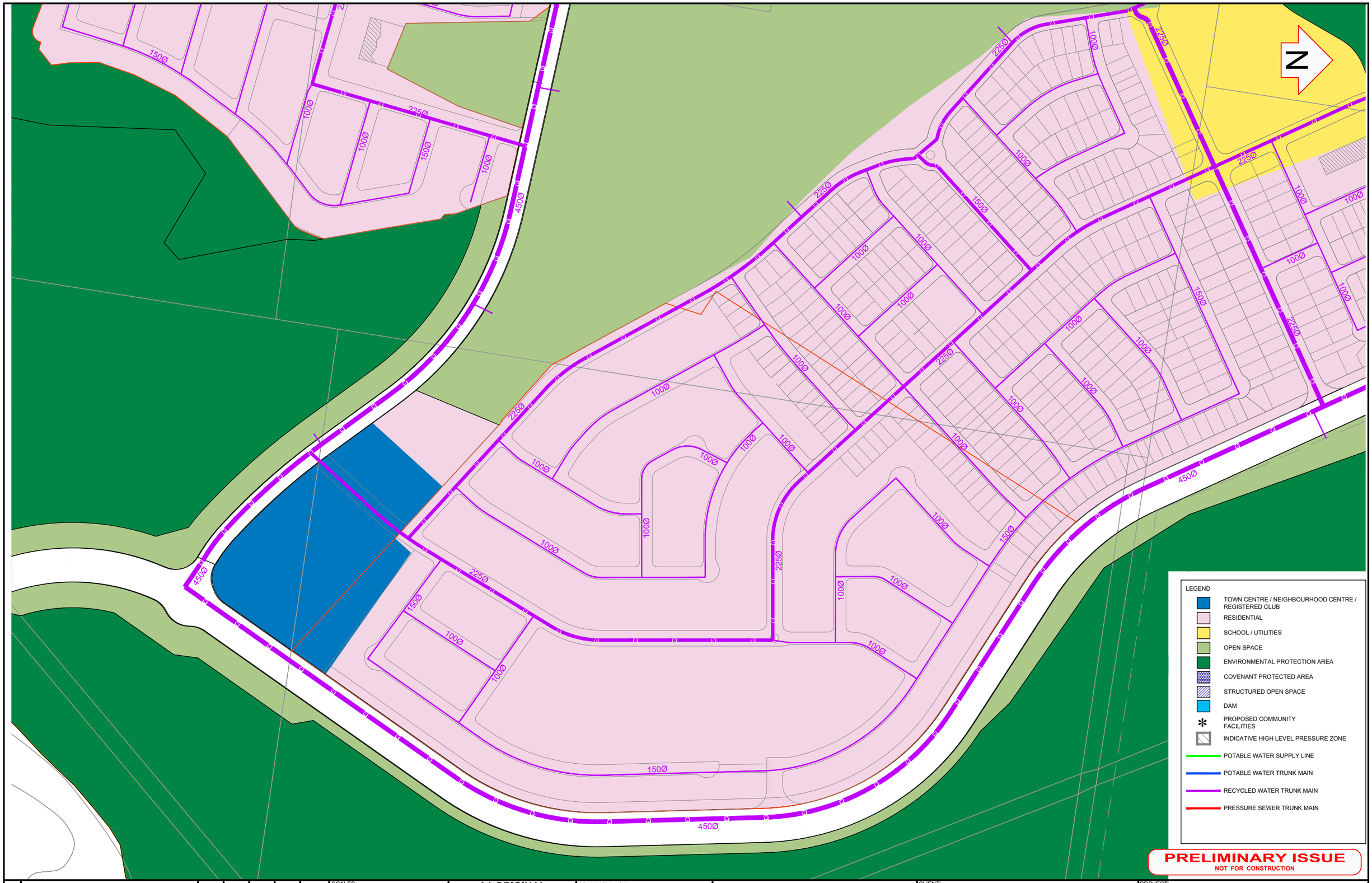

PRELIMINARY ISSUE
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ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:
NWS
NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
RECYCLED WATER SCHEME
DETAILED SHEET 4 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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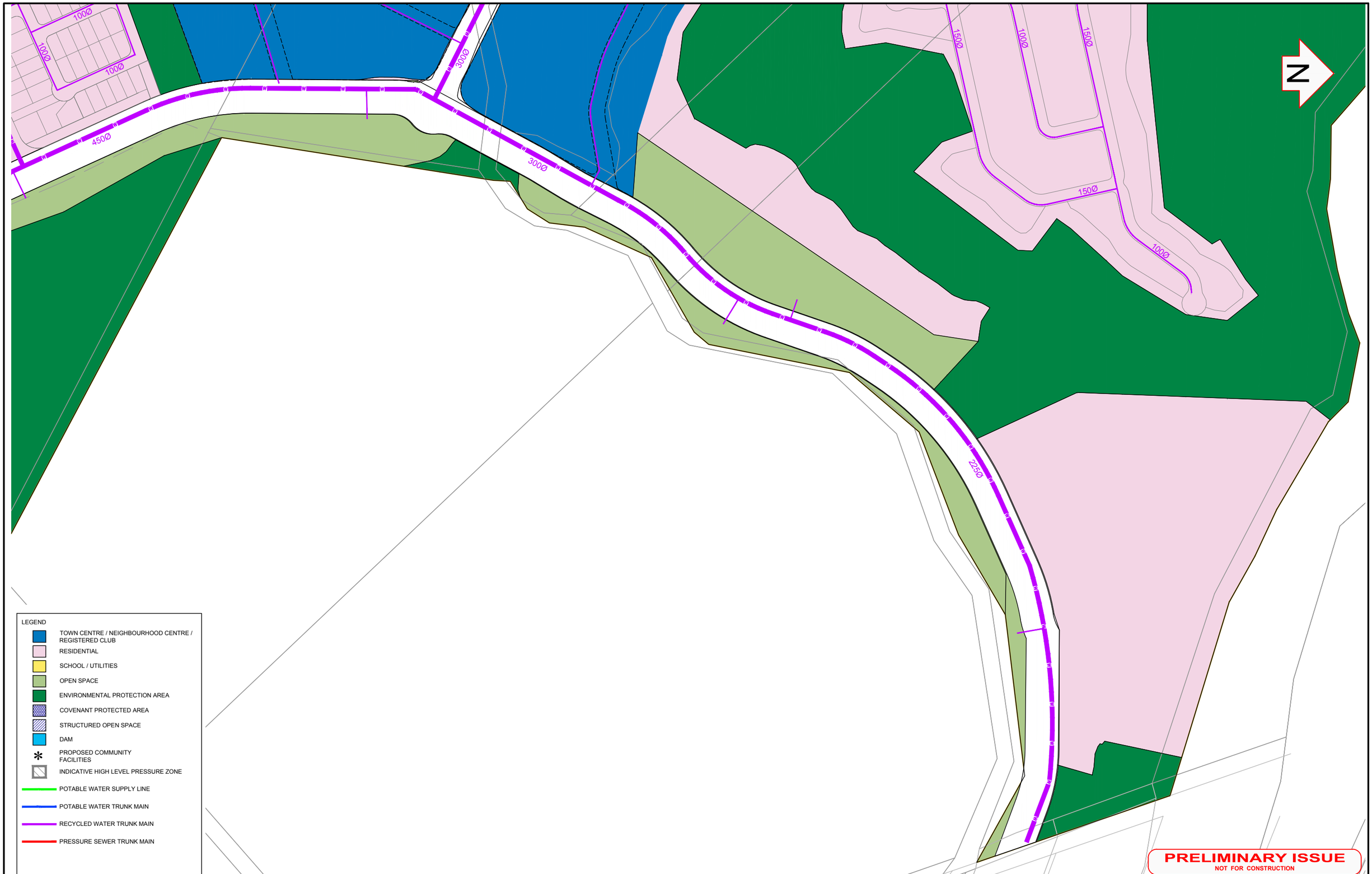

LEGEND

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- ENVIRONMENTAL PROTECTION AREA
- COVENANT PROTECTED AREA
- STRUCTURED OPEN SPACE
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- PROPOSED COMMUNITY FACILITIES
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- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN

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SCALES:

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
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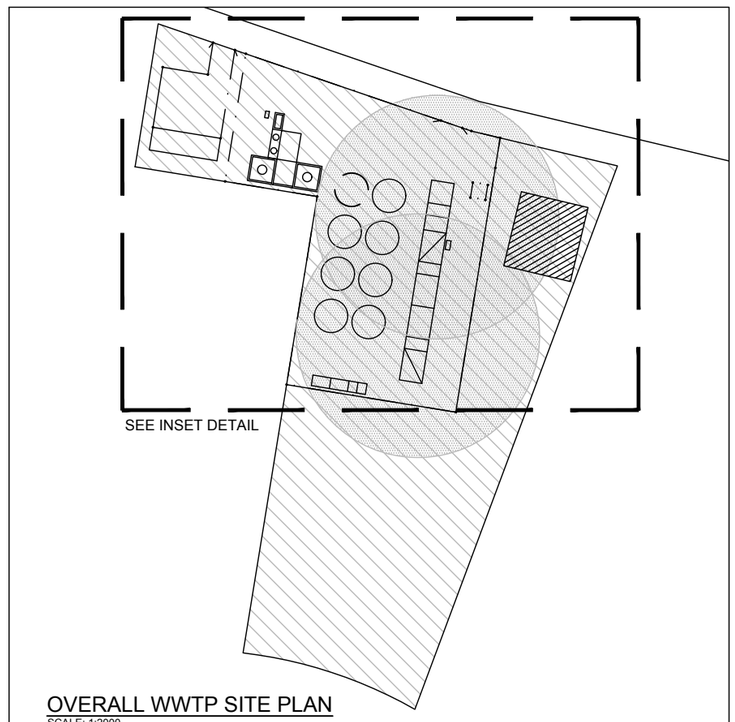
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
RECYCLED WATER SCHEME
DETAILED SHEET 5 OF 5

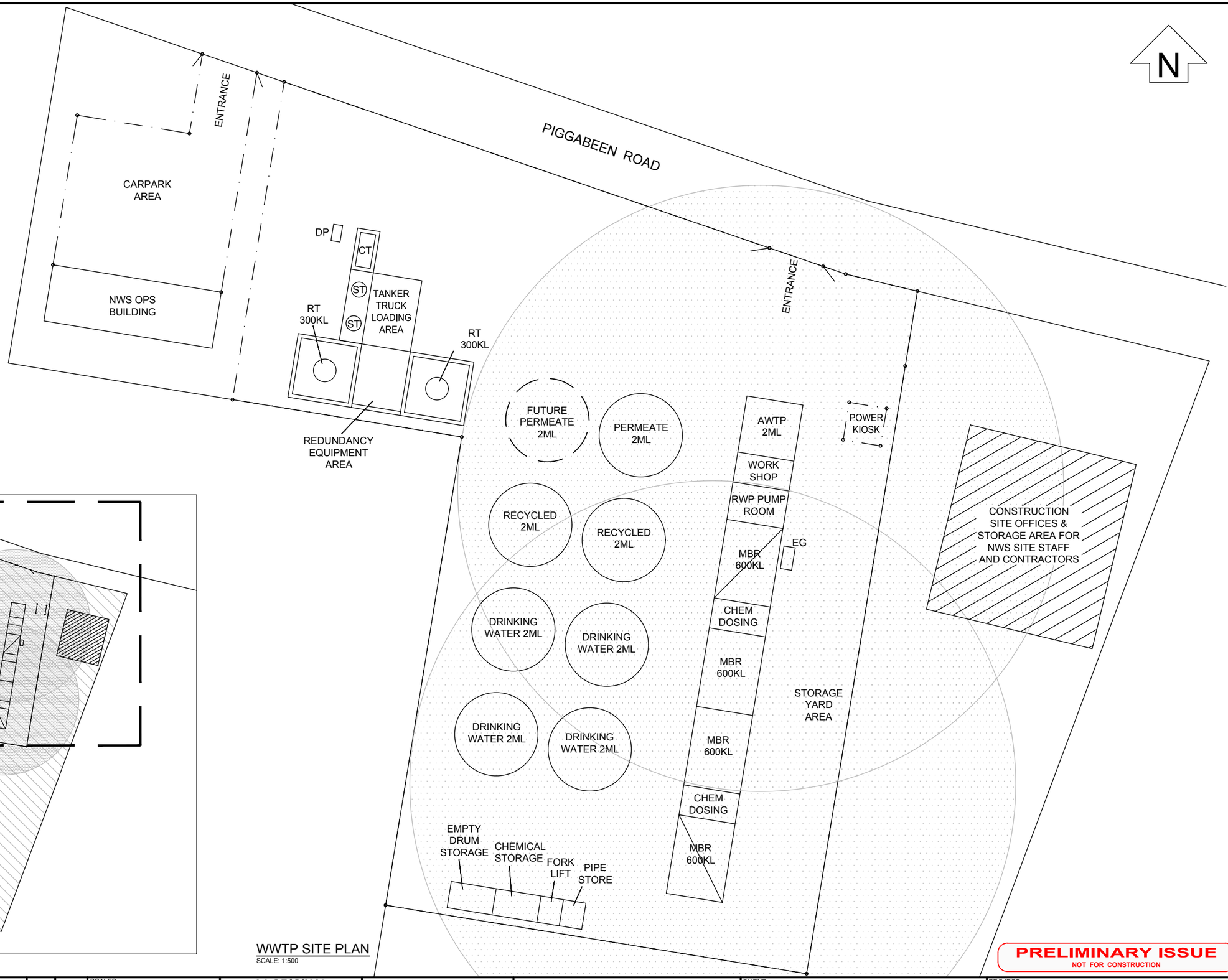
ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0017	B

Appendix 4.2.1D. WWTP Layout Drawings



SEE INSET DETAIL

OVERALL WWTP SITE PLAN
SCALE: 1:2000



WWTP SITE PLAN
SCALE: 1:500

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NOT FOR CONSTRUCTION

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
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ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT: NWS NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567
LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE
DRAWING TITLE: WASTE WATER TREATMENT PLANT SITE LAYOUT

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0401	C

LEGEND

- STAGE A - 0 TO 1,636 LOTS
- STAGE B - AFTER THE FIRST 400 LOTS
- STAGE C - 1,637 TO 4,911 LOTS
- STAGE D - 4,912 TO 6,544 LOTS

N

PIGGABEEN ROAD

ENTRANCE

CARPARK AREA

NWS OPS BUILDING

ENTRANCE

DP

CT

ST

ST

TANKER TRUCK LOADING AREA

RT 300KL

RT 300KL

REDUNDANCY EQUIPMENT AREA

FUTURE PERMEATE 2ML

PERMEATE 2ML

RECYCLED 2ML

RECYCLED 2ML

DRINKING WATER 2ML

DRINKING WATER 2ML

DRINKING WATER 2ML

DRINKING WATER 2ML

AWTP 2ML

WORK SHOP

RWP PUMP ROOM

MBR 600KL

EG

CHEM DOSING

MBR 600KL

MBR 600KL

CHEM DOSING

MBR 600KL

POWER KIOSK

CONSTRUCTION SITE OFFICES & STORAGE AREA FOR NWS SITE STAFF AND CONTRACTORS

STORAGE YARD AREA

EMPTY DRUM STORAGE

CHEMICAL STORAGE

FORK LIFT

PIPE STORE

SEE INSET DETAIL

OVERALL WWTP SITE PLAN
SCALE: 1:2000

WWTP SITE PLAN
SCALE: 1:500

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C	ISSUED FOR INFORMATION	21-10-16	CW	CW	AW	-

SCALES:

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LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE

DRAWING TITLE: WASTE WATER TREATMENT PLANT STAGING PLAN

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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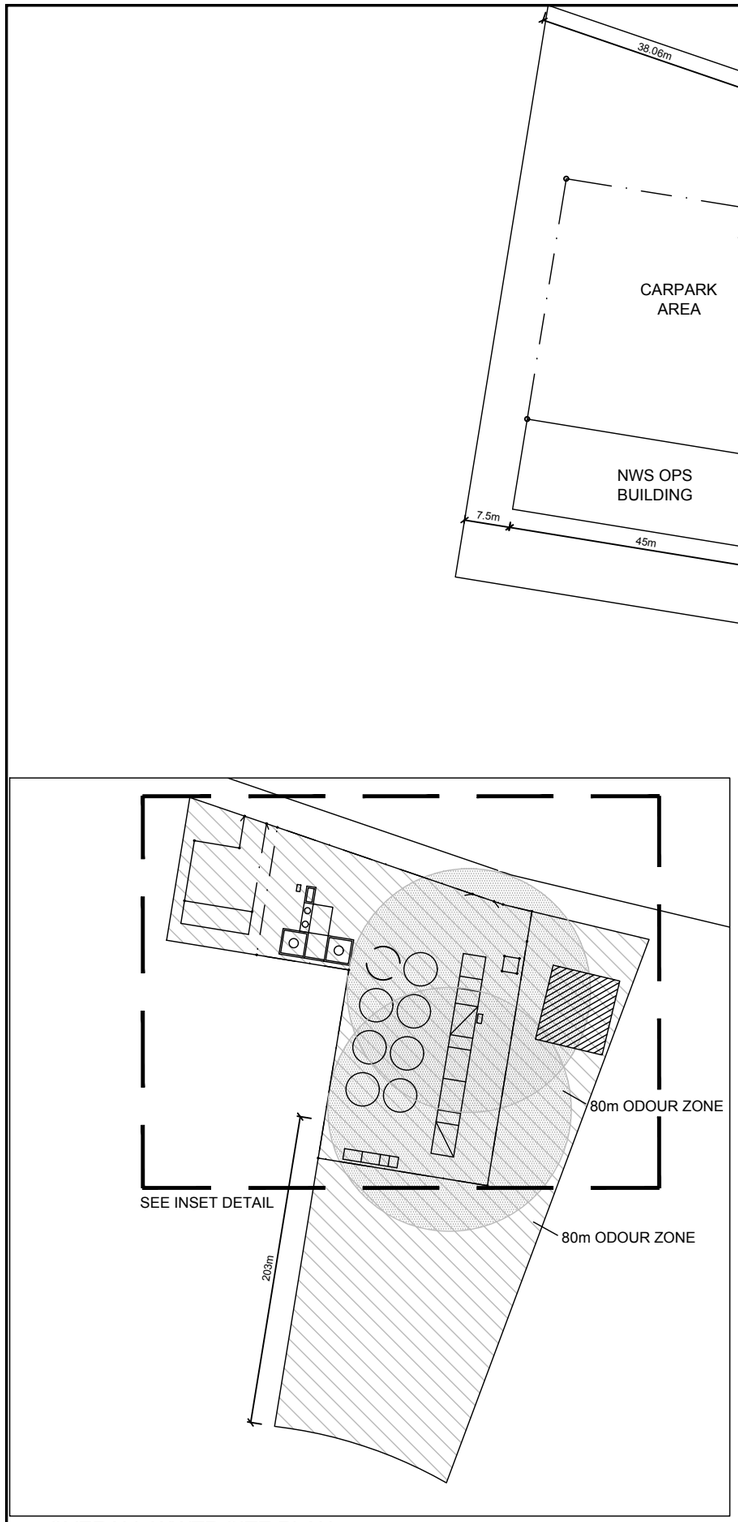
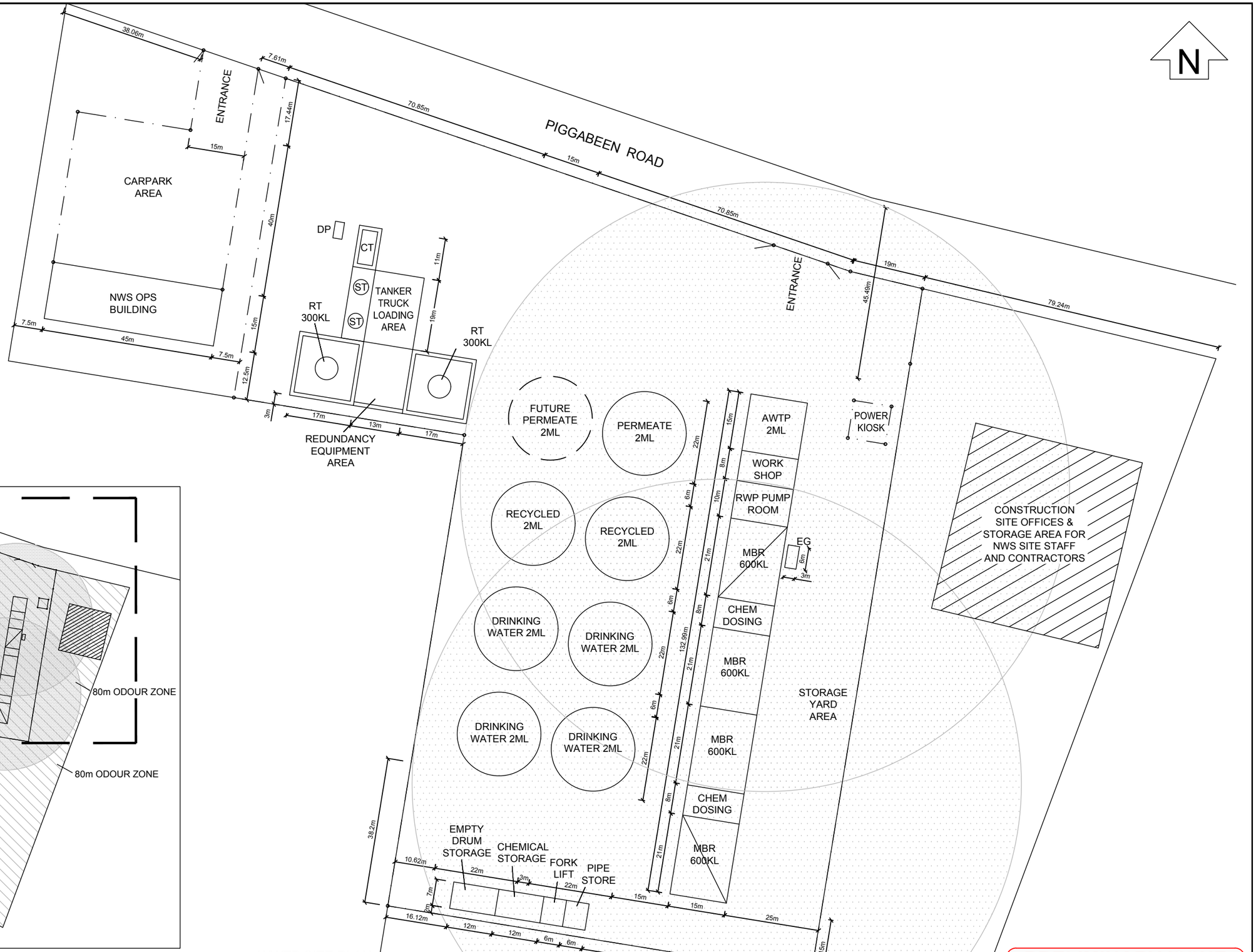


OVERALL WWTP SITE PLAN
SCALE: 1:2000



WWTP SITE PLAN
SCALE: 1:500

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C	ISSUED FOR INFORMATION	21-10-16	CW	CW	AW	-

SCALES:
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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES
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PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
WASTE WATER TREATMENT PLANT
DIMENSION PLAN

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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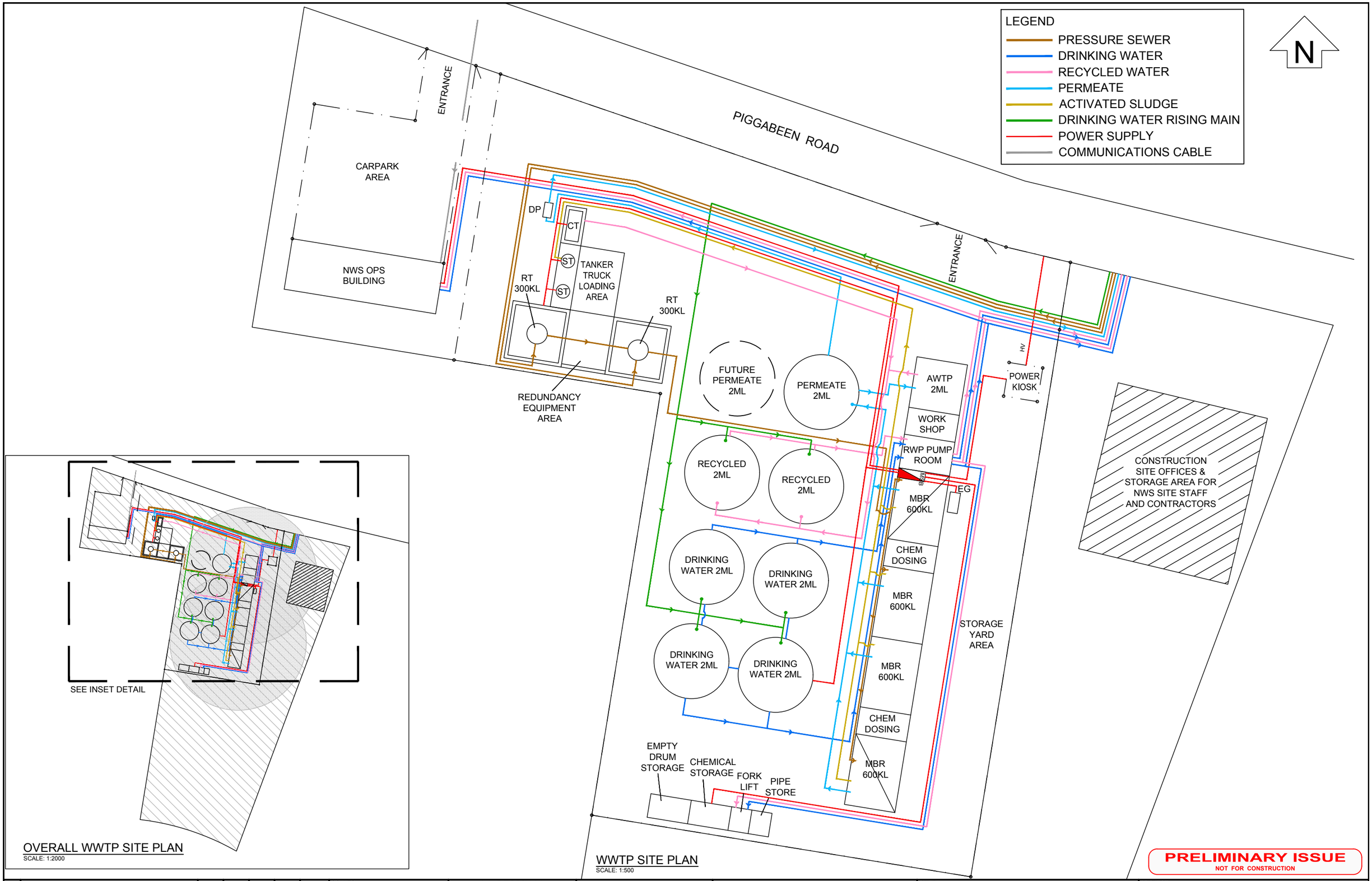

OVERALL WWTP SITE PLAN
SCALE: 1:2000

WWTP SITE PLAN
SCALE: 1:500

PRELIMINARY ISSUE
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SCALES:
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PO BOX 161
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LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE
DRAWING TITLE: WASTE WATER TREATMENT PLANT SERVICE CONNECTIONS

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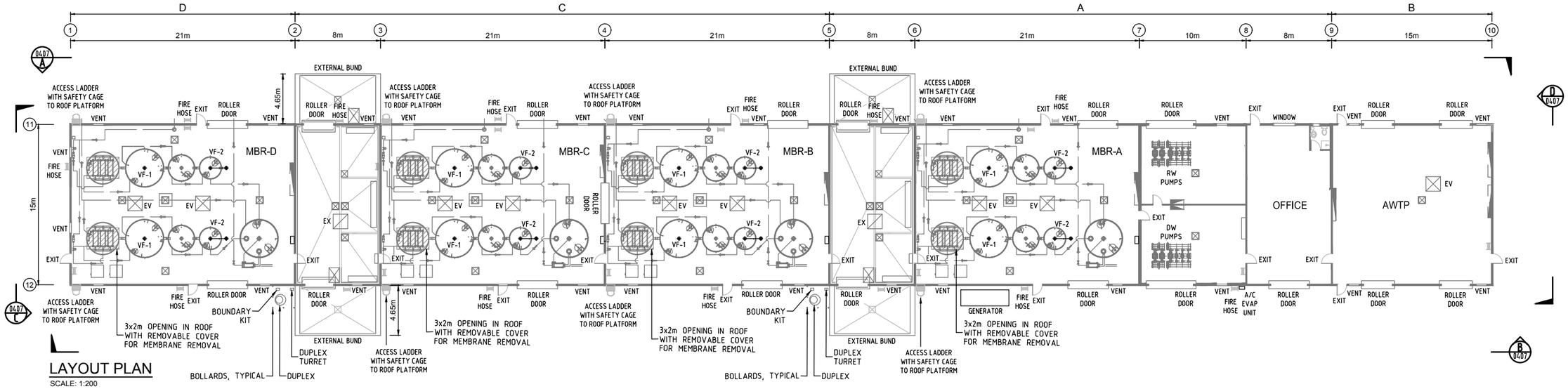
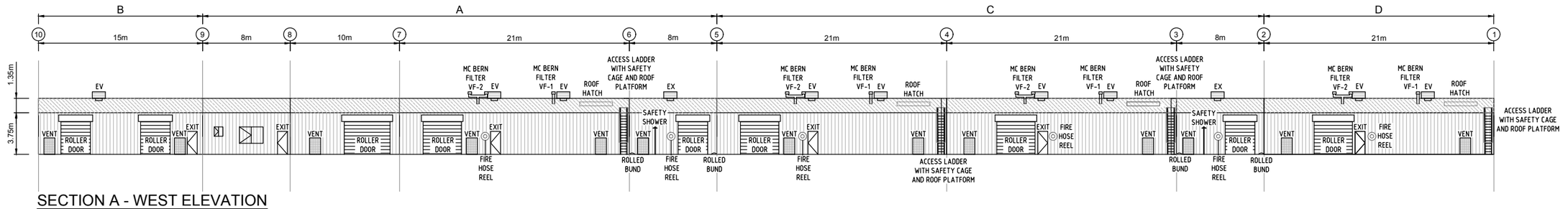
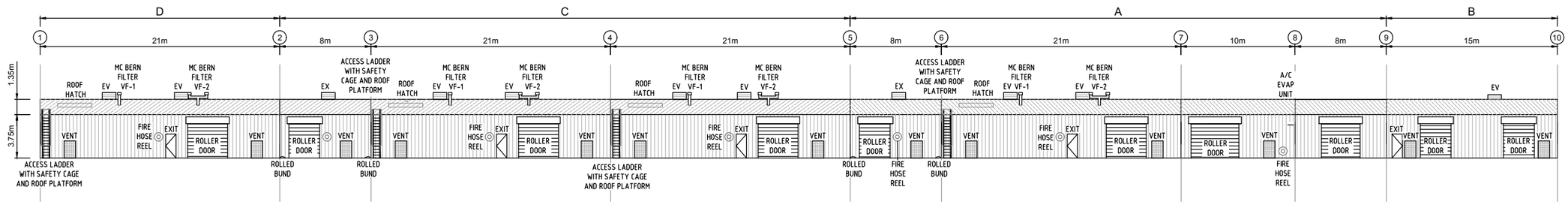


LAYOUT PLAN
SCALE: 1:200



SECTION A - WEST ELEVATION
SCALE: 1:200



SECTION B - EAST ELEVATION
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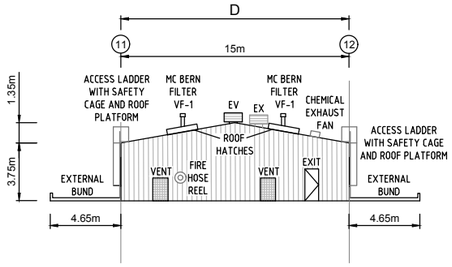
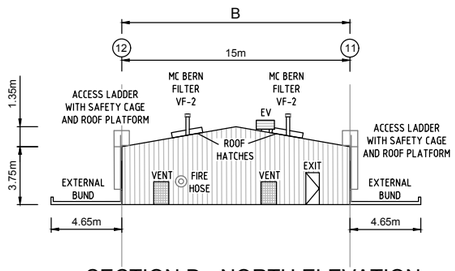


SECTION C - SOUTH ELEVATION
SCALE: 1:200

LEGEND

EV:	EVAPORATIVE COOLERS 3KW - 3PHASE
EX:	CHEMICAL EXHAUST FAN 1.9KW - 3PHASE
VF-1:	McBERNS CHARCOAL FILTER VF300
VF-2:	McBERNS CHARCOAL FILTER VF300 DOUBLE



SECTION D - NORTH ELEVATION
SCALE: 1:200

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C	ISSUED FOR INFORMATION	18-10-16	CW	CW	AW	-

SCALES:

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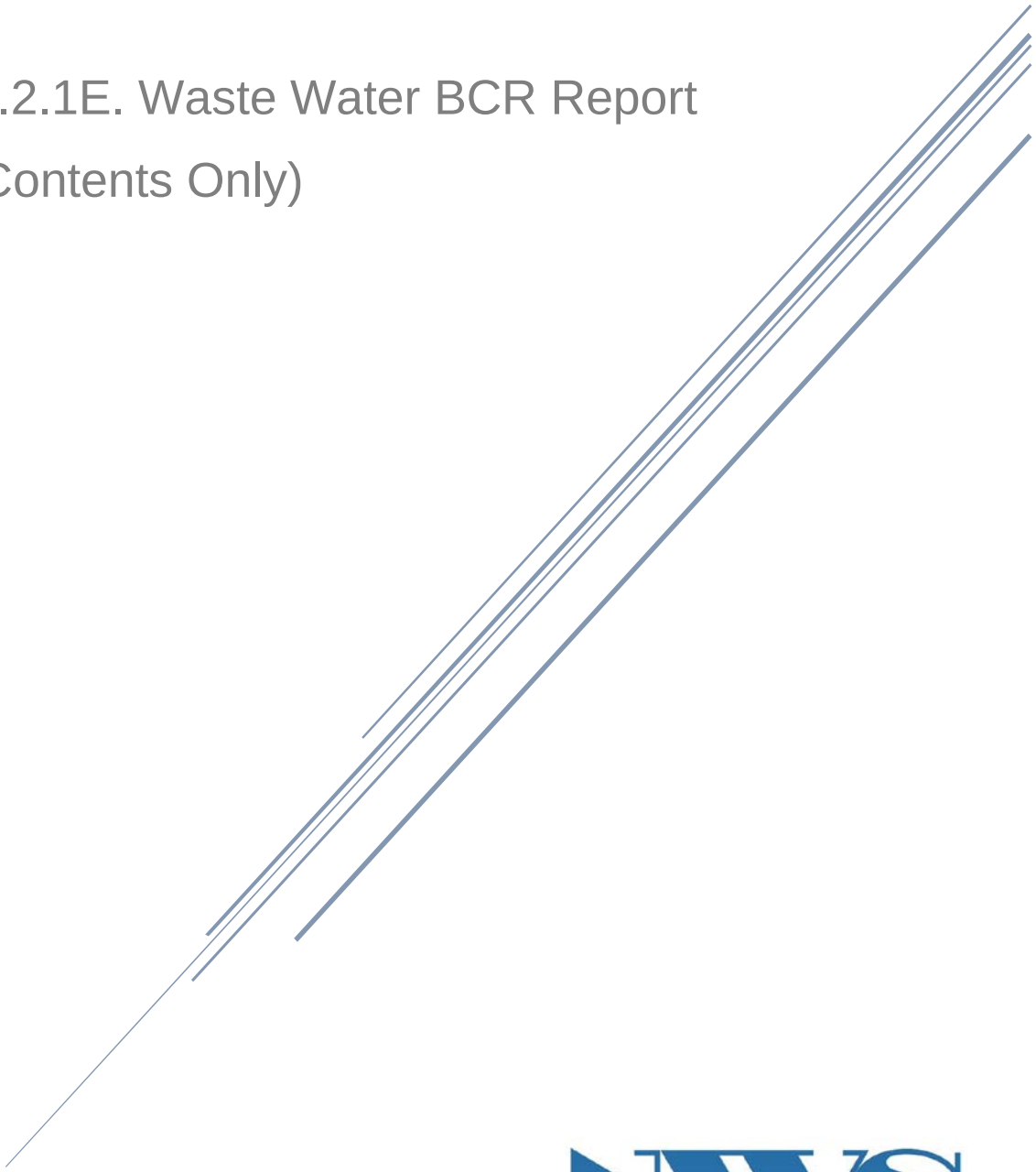
PROJECT: COBAKI ESTATE
DRAWING TITLE: WASTE WATER TREATMENT PLANT BUILDING LAYOUT AND ELEVATIONS STAGES A - D

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0406	C

Appendix 4.2.1E. Waste Water BCR Report

(Table of Contents Only)



Cobaki Estate – Waste Water Discharge Boundary Conditions Report

Northern Water Solutions Pty Ltd

WGM Consulting

Date: September 2016

Document No.: J116 – RPT002 – Rev05

Document Status

Version	Document type	Reviewed by	Checked by	Date Issued
Rev 01	Report	A. Wells	B. Gohl	30/06/2016
Rev 02	Report	S.Robinson	A.Wells	15/07/2016
Rev 03	Report	W Williamson	A Wells	19/07/2016
Rev 04	Report	W Williamson	A Wells	1/09/2016
Rev 05	Report	W Williamson	A Wells	7/09/2016

Project Details

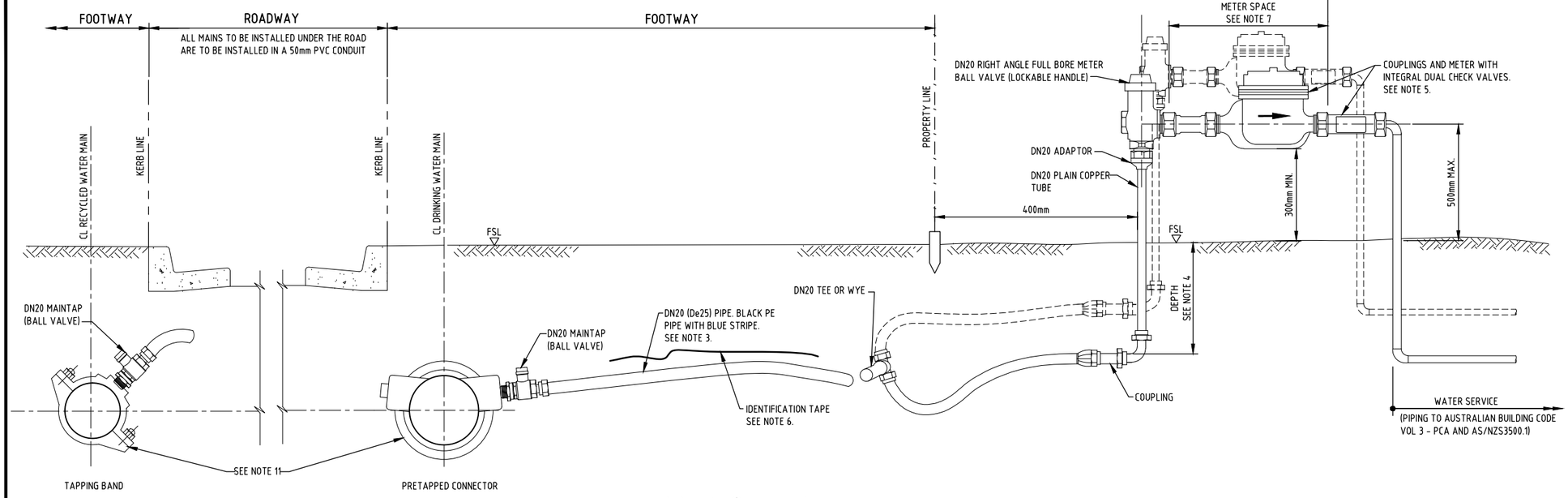
Project Name:	Cobaki Estate – Waste Water Discharge Boundary Conditions Report
Client	Northern Water Solutions Pty Ltd
CEO	Wayne Williamson
Authors	Andrew Wells
WGM Reference:	J116-RPT002

WGM Consulting
ABN 59 210 741 429
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
wgm@wgmconsulting.com.au

Contents

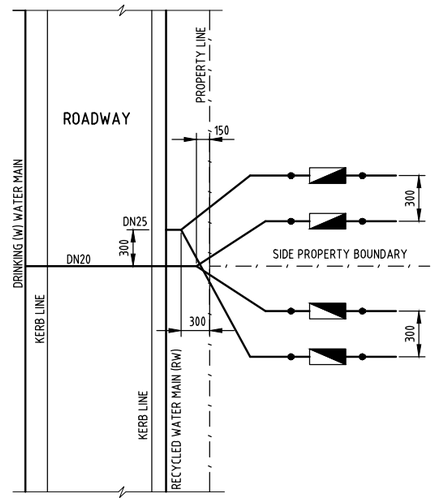
List of Figures

Appendix 4.2.5A. Recycled Water Meter Service Plans



APPROVED TAPPING METHODS
SEE NOTE 2

DRINKING WATER
SECTIONAL ELEVATION
TYPICAL SPLIT PROPERTY SERVICES PRE-LAID IN FOOTWAY



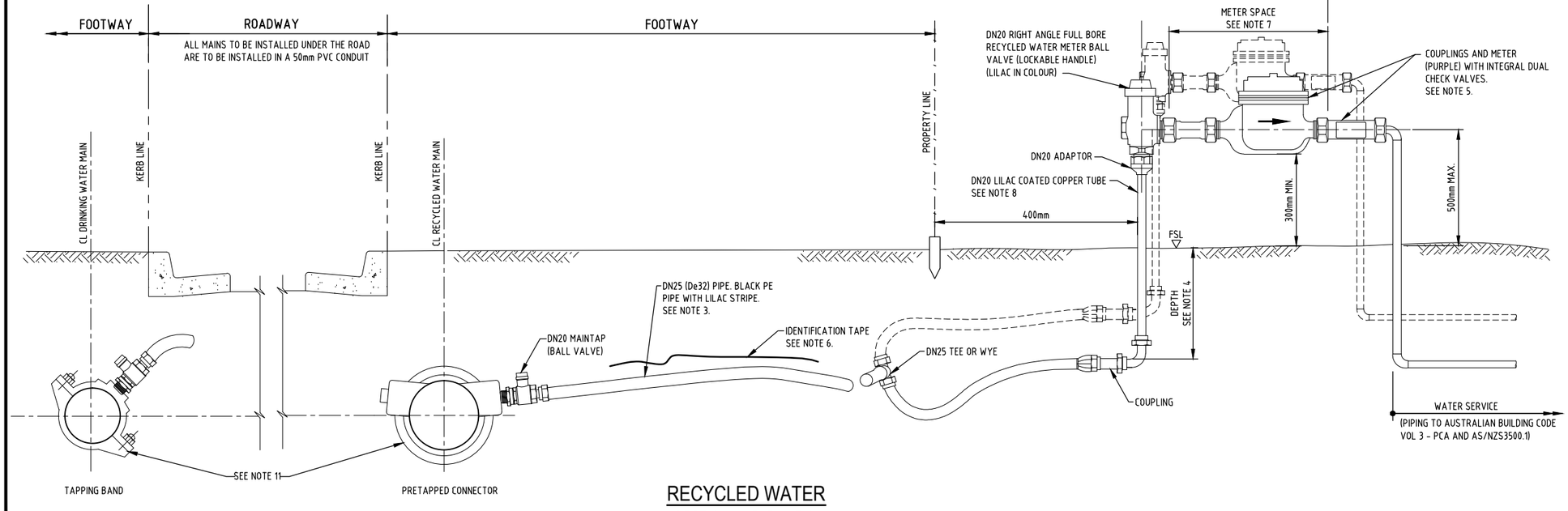
PLAN
PROPERTY SERVICES LAYOUT
("Y" SYSTEM SHOWN)
NTS

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. FOR APPROVED TAPPING METHODS, SEE WAT-1852-S (DICL MAINS) AND WAT-1853-S (PVC PR GRP MAINS). (SYDNEY WATER)
3. PROPERTY SERVICES CONNECTED TO PVC MAINS:
   ALL MATERIALS FOR USE IN PROPERTY SERVICES SHALL BE IN ACCORDANCE WITH THE AUSTRALIAN BUILDING CODE VOL 3 - PLUMBING CODE OF AUSTRALIA AND AS/NZ 3500.1 (MIN PN15).ALL PROPERTY SERVICE PIPE FOR RECYCLED WATER SHALL BE COLOURED BLACK WITH LILAC (P23) STRIPES (LONGITUDINAL) TO AS 2700.
   WHERE THE NOMINAL SIZE OF A PIPE IS SPECIFIED, AN EQUIVALENT PIPE SIZE APPROPRIATE TO THE MATERIAL BEING USED TO BE AS SPECIFIED IN AS 3500.1, TABLE 1.1.
   PROPERTY SERVICES TO BE CONTINUOUS (WITHOUT JOINTS) BETWEEN MAINTAP BALL VALVE AND METER RISER.
4. DEPTHS TO BE IN ACCORDANCE WITH ABC VOL 3 - PCA AND AS/NZ 3500.1
5. METERS WITH DUAL CHECK VALVES REQUIRED FOR DRINKING WATER AND RECYCLED WATER PROPERTY SERVICES.
6. PROVIDE IDENTIFICATION TAPE ON ALL PROPERTY SERVICES WITHIN THE FOOTWAY & ROADWAY UP TO THE BALL VALVE.
   AS APPROPRIATE, TAPE TO BE COLOURED:
   (i) "LILAC" AND MARKED "CAUTION RECYCLED MAIN BURIED BELOW - DO NOT DRINK" OR
   (ii) "GREEN" AND MARKED "CAUTION WATER MAIN BURIED BELOW"
7. METER SPACE -
   DRINKING AND RECYCLED WATER
   METER SPACE FOR DRINKING WATER IS THE DISTANCE BETWEEN THE THREADED END OF THE BALL VALVE AND THE THREADED END OF THE ELBOW. DISTANCES ARE AS FOLLOWS:

METER SIZE	20	25
METER SPACE	300	300

8. USE COPPER TUBE PRECOATED WITH LILAC COLOURED PE FOR RISERS ON RECYCLED WATER SERVICES.
   USE COPPER TUBE FOR POTABLE WATER SERVICE.
9. INSTALL SERVICES FROM MAIN TO METER IN A STRAIGHT LINE AND AT RIGHT ANGLES TO KERB LINE.
10. LOCATE PROPERTY SERVICES FROM MAIN TO METER, (DRINKING AND RECYCLED WATER) IN THE ONE STREET ONLY, AT FRONTAGE OF PROPERTIES. PLACE DRINKING AND RECYCLED WATER METERS TOGETHER 400mm FROM THE FRONT BOUNDARY AND PARALLEL TO A SIDE BOUNDARY WITHIN A DISTANCE OF 600mm.
11. RECYCLED WATER MAIN & POTABLE WATER MAIN TO BE LOCATED ON OPPOSITE SIDES OF ROAD.
12. METERS TO BE LOCATED IN ACCORDANCE WITH NWS "GUIDELINES".
13. POTABLE AND RECYCLED WATER METERS TO BE INSTALLED ON OPPOSITE SIDES OF PSU IF LOCATED ON THE SAME PROPERTY.



APPROVED TAPPING METHODS
SEE NOTE 2

RECYCLED WATER
SECTIONAL ELEVATION
TYPICAL SPLIT PROPERTY SERVICES PRE-LAID IN FOOTWAY

FOR INFORMATION

INDEX	DATE	REVISIONS	DRAWN	CHECKED	PASSED
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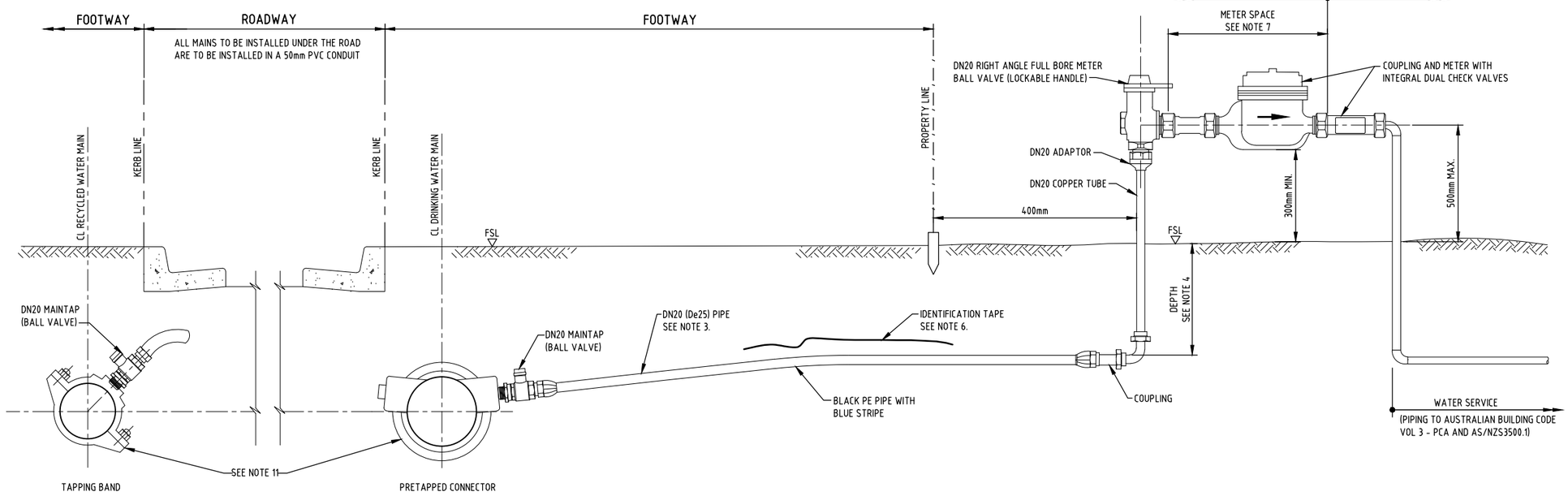
A1

NORTHERN WATER SOLUTIONS

Northern Water Solutions

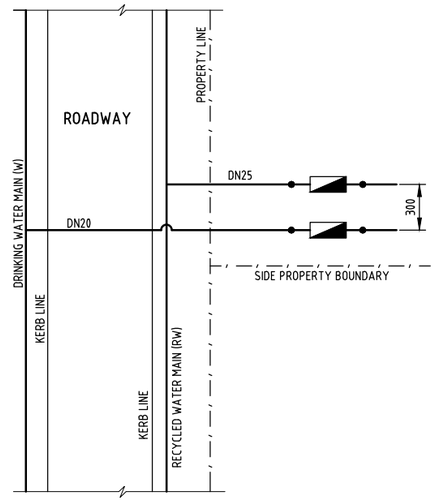
NORTHERN WATER SOLUTION STANDARD DRAWING
DUAL WATER RETICULATION SYSTEM
SPLIT PROPERTY SERVICES
PRE-LAID IN FOOTWAYS

SCALE NOT TO SCALE
SHEET 1 OF 1 SHEETS
DRAWING NO. NWS-STD-WAT-2
A

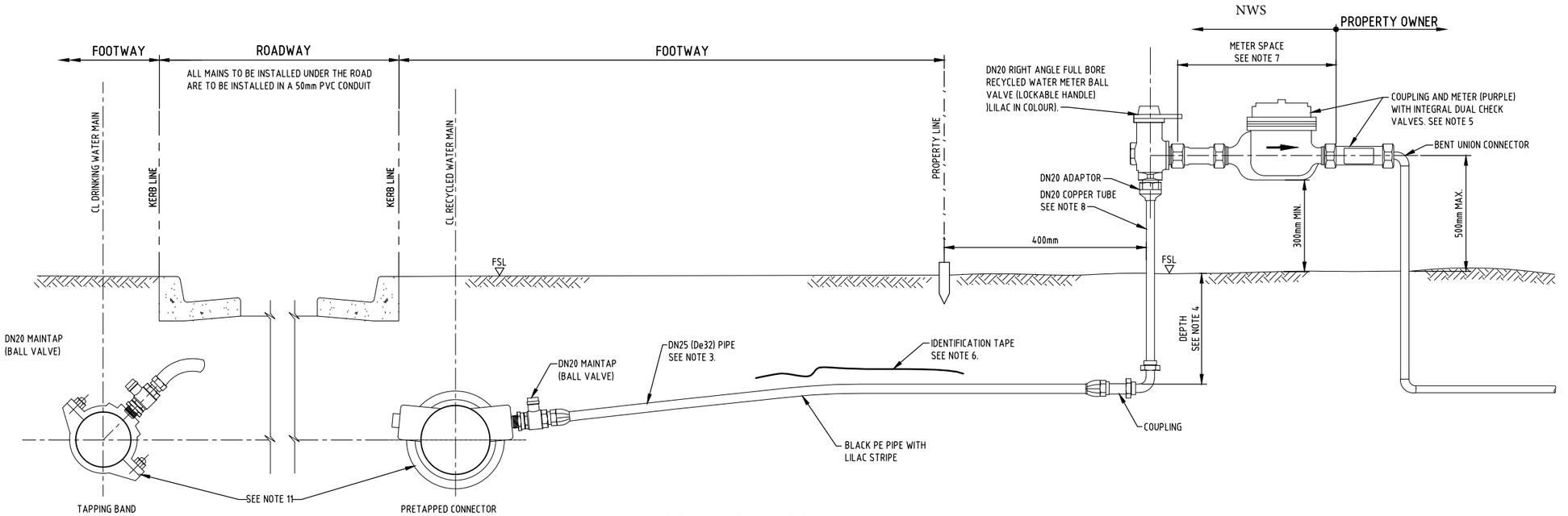


APPROVED TAPPING METHODS
SEE NOTE 2

DRINKING WATER
SECTIONAL ELEVATION
TYPICAL SINGLE PROPERTY SERVICES PRE-LAID IN FOOTWAY



PLAN
PROPERTY SERVICES LAYOUT
NTS



APPROVED TAPPING METHODS
SEE NOTE 2

RECYCLED WATER
SECTIONAL ELEVATION
TYPICAL SINGLE PROPERTY SERVICES PRE-LAID IN FOOTWAY

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

2. FOR APPROVED TAPPING METHODS, SEE WAT-1852-S (DICL MAINS) AND WAT-1853-S (PVC PR GRP MAINS). (SYDNEY WATER)

3. PROPERTY SERVICES CONNECTED TO PVC MAINS:
   ALL MATERIALS FOR USE IN PROPERTY SERVICES SHALL BE IN ACCORDANCE WITH THE AUSTRALIAN BUILDING CODE VOL 3 - PLUMBING CODE OF AUSTRALIA AND AS/NZ 3500.1 (MIN PN15).ALL PROPERTY SERVICE PIPE FOR RECYCLED WATER SHALL BE COLOURED BLACK WITH LILAC (P23) STRIPES (LONGITUDINAL) TO AS 2700.
   WHERE THE NOMINAL SIZE OF A PIPE IS SPECIFIED, AN EQUIVALENT PIPE SIZE APPROPRIATE TO THE MATERIAL BEING USED TO BE AS SPECIFIED IN AS 3500.1, TABLE 1.1.
   PROPERTY SERVICES TO BE CONTINUOUS (WITHOUT JOINTS) BETWEEN MAINTAP BALL VALVE AND METER RISER.

4. DEPTHS TO BE IN ACCORDANCE WITH ABC VOL 3 - PCA AND AS/NZ 3500.1

5. METERS WITH DUAL CHECK VALVES REQUIRED FOR DRINKING WATER AND RECYCLED WATER PROPERTY SERVICES.

6. PROVIDE IDENTIFICATION TAPE ON ALL PROPERTY SERVICES WITHIN THE FOOTWAY & ROADWAY UP TO THE BALL VALVE.
   AS APPROPRIATE, TAPE TO BE COLOURED:
   (i) "LILAC" AND MARKED "CAUTION RECYCLED MAIN BURIED BELOW - DO NOT DRINK" OR
   (ii) "GREEN" AND MARKED "CAUTION WATER MAIN BURIED BELOW"

7. METER SPACE -
   DRINKING AND RECYCLED WATER
   METER SPACE FOR DRINKING WATER IS THE DISTANCE BETWEEN THE THREADED END OF THE BALL VALVE AND THE THREADED END OF THE ELBOW. DISTANCES ARE AS FOLLOWS:

METER SIZE	20	25
METER SPACE	300	300

8. USE COPPER TUBE PRECOATED WITH LILAC COLOURED PE FOR RISERS ON RECYCLED WATER SERVICES.
   USE COPPER TUBE FOR POTABLE WATER SERVICE.

9. INSTALL SERVICES FROM MAIN TO METER IN A STRAIGHT LINE AND AT RIGHT ANGLES TO KERB LINE.

10. LOCATE PROPERTY SERVICES FROM MAIN TO METER, (DRINKING AND RECYCLED WATER) IN THE ONE STREET ONLY, AT FRONTAGE OF PROPERTIES. PLACE DRINKING AND RECYCLED WATER METERS TOGETHER 400mm FROM THE FRONT BOUNDARY AND PARALLEL TO A SIDE BOUNDARY WITHIN A DISTANCE OF 600mm.

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Northern Water Solutions

STANDARD DRAWING
DUAL WATER RETICULATION SYSTEM
SINGLE PROPERTY SERVICES
PRE-LAID IN FOOTWAYS

SCALE NOT TO SCALE
SHEET 1 OF 1 SHEETS
DRAWING NO. NWS-STD-WAT-1
A

Appendix 4.2.10A. Recycled Water Preliminary Risk Assessment

Project: **COBAKI ESTATE TWEED HEAD NSW**
Client: **Leda Manor Stead**
Title: **Appendix 4.2.10 Recycled** Water Preliminary Risk Assessment for IPART Application
Author: WW
Date (Revision): 14/07/2016 (Revision C)
Risk Criteria: As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
MBR Treated Waste Water	Trace contaminants in MBR feed effluent/Waste Water	Trace contaminants following MBR treatment	Potential impacts on recycled water uses	B	Unlikely	2	Minor	Low	1. Majority of waste water is from the residential catchment hence there is a low likelihood of significant trace contaminants being present in the treated effluent. Refer to sewerage wastewater generation risk assessment table. 2. Customer supply contracts, recycled water use agreements and ongoing awareness and education through information provided with rates notices and via the NWS Website. 3. Regular detailed Nata certified lab testing of the recycled water quality monitoring for trace contaminants. 4. If contaminants are detected a source control investigation will be undertaken through analysis of raw wastewater data. 5. All treated effluent (Permeate) will have additional treatment will be provided in the AWTP process using Ultra Filtration, UV disinfection & Chlorine Contact.	B	Unlikely	2	Minor	Low
	Poor quality Feed Water Permeate from MBR	Membrane failure, Equipment Failure etc	Poor quality feed water permeate to the AWTP process	B	Unlikely	2	Moderate	Moderate	1. Continuous online monitoring and alarms on critical MBR process parameters MLSS, DO, Permeate Turbidity, UV Intensity, transmembrane pressure or equipment failure. 2. Shut down of the MBR WWTP if any of the above events were to occur which could produce poor quality Permeate. 3. The SCADA control system will send a critical alarm to the plant operator if any of the above events should occur.	B	Unlikely	2	Minor	Low
Advanced Water Treatment Plant	Pathogen break through from UF membranes	Rupture of membrane fibers	Non-compliant recycled water	B	Unlikely	4	Major	Very high	1. Use USEPA accredited ultrafiltration membranes. 2. Membrane integrity testing by air pressure decay as per manufacturer requirements. 3. Continuous online monitoring of UF permeate turbidity with alarms and automatic shutdown. 4. Continuous online monitoring and alarms on transmembrane pressure. 5. High quality MBR permeate as feed water. 6. Membrane chemical cleaning in line with manufacturer requirements to maximize membrane life. 7. Design flux, TMP and other process parameters as per manufacturer recommendations to maximize membrane life and maintain design flow.	B	Unlikely	4	Major	Low
	Inadequate pathogen inactivation due to low UV dose	Inadequate UV dose caused by lamp failure, reactor fouling, high flow, poor feed water quality	Non-compliant recycled water	B	Unlikely	4	Major	Very high	1. Use USEPA accredited UV disinfection system. 2. Continuous online monitoring of UV intensity and UV lamp faults with alarms and automatic shutdown. 3. Continuous online monitoring of flow through the UV reactor with alarms and automatic shutdown. 4. UV unit to include self- cleaning functions. 5. Design and operation of UV unit as per manufacturer recommendations. 6. Replace UV lamps every 12 months or when low dose alarms are activated.	B	Unlikely	4	Moderate	Low
	Inadequate pathogen die off due to low CT in chlorine contact tank	Inadequate CT due to low chlorine concentration, high flow, low level in CCT, high COD, high temperature, incorrect pH	Non-compliant recycled water	B	Unlikely	4	Major	Very high	1. Chlorine contact tank designed to USEPA standards. 2. Continuous online monitoring of free chlorine residual and pH at the outlet of the CCT with alarms and automatic shutdown. 3. Continuous online monitoring of flow and water level in the CCT with alarms and automatic shutdown.	B	Unlikely	4	Major	Low
	High salt concentration	High salt concentration in feed water	Non-compliant recycled water	C	Possible	2	Minor	Moderate	1. Continuous online monitoring and control of EC/TDS in blended product water. The ratio of UF treated recycled water will automatically be mixed with drinking water if the EC/TDS increases to above 500 TDS in the finished recycled water. 2. Continuous online monitoring of feed water MBR permeate EC/TDS with alarms. 3. If there is persistent high TDS in MBR permeate feed water then a source control investigation will be undertaken through review of catchment raw wastewater quality and waste water data.	B	Unlikely	2	Minor	Low

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Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
	Process chemicals	Spillage of chemicals used in the AWTP process	Potential OH&S and public health impacts. Potential environmental impacts in receiving environment	C	Possible	2	Moderate	Moderate	1. Appropriate bund and separation in chemical storage and delivery areas. 2. Standard operating procedures to be developed for use of all chemicals. 3. MSDS of all chemicals maintained onsite. 4. Emergency Response Plan for chemical spillages.	B	Unlikely	2	Minor	Low
Advanced Water Treatment Plant continued…	Metals, organic chemicals and other potential trace contaminants.	Presence of excessive amounts of metals, organic chemicals and other trace contaminants in treated Class A+ Recycled Water	Potential OH&S, public health and environmental impacts.	B	Possible	2	Minor	Low	1. Prevention strategy based around Trade Waste Agreements, Residential Supply Agreements, ongoing awareness and education at each billing cycle. 2. Predominately residential catchment, hence the likelihood of significant levels of contaminants is low. 3. Detailed monitoring of treated recycled water quality for trace contaminants at NATA laboratory. 4. If contaminants are detected a source control investigation will be undertaken through review of catchment raw wastewater and trade waste data. 5. If required additional treatment will be provided in the AWTP through activated carbon adsorption and/or ion exchange processes.	B	Possible	2	Minor	Low
	UF membrane chemical cleaning wastewater or UV acid clean wastewater	Management of chemical contaminated wastewater	Potential impacts on the MBR treatment process if inappropriately managed	B	Possible	3	Moderate	Moderate	1. All chemical contaminated wastewater from UF membrane and/or UV disinfection unit cleaning is to be treated in the UF neutralizing tank with pH correction and SMBS for the removal of chlorine in the backwash waste water. When the backwash has completed its cycle and the sensing probes advice the backwash water pH & Chlorine residual is to the correct levels can then be pumped back to the MBR inlet tank for processing with the waste water. 2. Neutralization of all chemical contaminated wastewater before feed back to the MBR inlet balance tank. 3. If process impacts are observed on the MBR then offsite disposal of chemical wastewater will be undertaken by licensed waste contractor.	B	Possible	2	Minor	Low
Treated effluent 2ML Permeate Water Storage Tank and 4 x 2ML Recycled Water Storage Tanks	Vector borne diseases	Vermin or mosquito access to permeate water storage tank	Class A Permeate feed water	B	Possible	2	Minor	Low	1. Storage tank constructed to drinking water standards with mosquito screens on all tank openings and overflows. 2. Regular monitoring and inspection for evidence of vermin or mosquito access. 3. If observed contaminated water will be wasted or if appropriate chemical treatment of the storage will be undertaken by addition of chlorine tablets, hydrogen peroxide or similar.	B	Unlikely	2	Minor	Low
	Overflows	Tank overflow due to failure of level controls	Overflow to the TSC sewerage network	B	Unlikely	2	Minor	Low	1. The permeate storage tank overflows/discharges directly to the TSC SPS at Cobaki Parkway and Sandy Road roundabout.	A	rare	1	Insignificant	Low
	Decay of free chlorine residual during storage	Loss of adequate free chlorine residual due to equipment failure, high temperature, long detention time or high COD	Nil	A	Rare	1	Minor	Low	1. Free chlorine monitoring and sodium hypochlorite dosing and alarms on the permeate water storage tank are not required. 2. If required chlorine tablets can be manually applied to the storage.	A	rare	1	Insignificant	Low
	Blue green algae	Blue green algae growth in permeate water storage tank	Non-compliant permeate feed water	A	Rare	1	Minor	Low	1. The Permeate Storage tank is covered to prevent sunlight access and algae growth. 2. Regular inspection and monitoring of permeate water storage tank.	A	Rare	1	Insignificant	Low
	Unintended contact with permeate water in storage	Human access to storage	Potential public health impacts	D	Likely	2	Minor	Low	1. Storage located inside the fenced and secure WWTP site. 2. Warning signage around the perimeter of the site and on each storage tank. 3. CCTV recording at the WWTP site. 4. Lockable manhole access points.	B	Unlikely	2	Minor	Low
	Tank failure	Tank failure	Flooding, contamination of surface water	C	Possible	2	Minor	Low	1. Tank constructed from steel panel tanks with civil/structural engineer certification for tank and footings. 2. Quality assurance in construction. 3. Bollard fence around tanks if there is a risk of vehicular or machinery damage.	B	Unlikely	2	Minor	Low
	Tank materials	Dissolution of trace metals into permeate feed water	Non-compliant permeate water	A	Possible	1	Minor	Low	1. Ensure all tank materials are compatible for use with potable water. 2. Metallic tanks to be lined with a food grade polymer liner to avoid dissolution of metals.	A	Rare	1	Minor	Low

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Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Recycled Water Supply System	Cross connections	Cross connection with the Cobaki Estate drinking water network	Contamination of drinking water supply	D	Likely	4	Major	Very high	1. Only approved contractors or staff that have undergone an NWS induction can perform work on NWS water utility infrastructure. 2. Drinking Water and Recycled water reticulation networks have been designed, constructed and tested in accordance with the WSAA standards, The Plumbing code of NSW & AS3500. 3. Water pressure in Recycled Water network is to be maintained a minimum of 50 KPA below the pressure in the Drinking Water network. 4. Quality assurance, inspection (ITPs) and pressure testing during construction. 5. Ongoing monitoring of water pressure and electrical conductivity in both networks during operation to assist with detection of cross connections. 6. Unique pipe materials in each water network. The drinking water network will use blue PVC and blue stripped HDPE pipe and the Recycled Water network will use lilac colored UPVC pipe and fittings & lilac striped HDPE pipe. 7. Minimum pipe separation distances to be maintained in common trenches. Drinking water pipework to be located above Recycled water pipework. 8. Identification tape and signage on all trenches. 9. Drinking water will be used in the recycled water network until Stage B is completed when the AWTP is constructed. Compliance audits will be undertaken prior to introducing recycled water to the network. 10. Conservative AWTP log reduction targets based on Table 3.7 in AGWR (2006).	B	Unlikely	4	Major	High
Recycled Water Storage Tanks 2 x 2ML	Decay of free chlorine residual during storage	Loss of adequate free chlorine residual due to equipment failure, high temperature, long detention time or high COD	Non-compliant Recycled Water for domestic reuse	A	Possible	2	Minor	Low	1. Chlorine residual is monitored 24/7 in the leaving water from the recycled water storage tanks. 2. A chlorine addition dosing system will inject chlorine into the suction side of the recycled water variable pump station. 3. Downstream on the outlet side of the pump unit an inline mixer will be installed to mix the leaving waters. 4. A chlorine sensor is mounted at the required distance downstream of the inline mixing unit to measure the chlorine residual 24/7. 5. The chlorine residual must be maintained between .2 to .6 PPM.					
	Cross connections continued…	Cross connection with drinking water line on private property	Potential use of recycled water for drinking water uses inside the affected property (up to say 3 EP)	C	Possible	2	Moderate	Moderate	1. All plumbing work on private property to be undertaken by a licensed plumber in compliance with AS3500 and the NSW Plumbing Code. 2. Plumbing inspection during house construction and a cross flow connection test certificate must be provided to TSC and presented with each customer connection application for drinking water, recycled water & sewer connection. No drinking water or recycled water meters will be issued to the customer unless a cross flow certificate is provided. 3. Dual check valve to be located at the drinking water connection point to each property. 4. Residential Customer Supply Contracts outlining responsibilities under the Cobaki Estate scheme. 5. Ongoing customer awareness and education with information provided at each billing cycle and on the NWS Water Utility website. 6. Conservative AWTP log reduction target based on Table 3.7 in AGWR (2006).	C	Possible	3	Moderate	Moderate
	Unintended or inappropriate uses of recycled water	Unintended uses of recycled water like swimming pool top up, drinking from outdoor taps, ingestion from excessive spray drift etc	Potential use of recycled water for drinking water uses	D	Likely	3	Moderate	Moderate	1. Residential customer supply contracts and recycled water use agreements. 2. Ongoing awareness and education with information provided at each billing cycle and on the NWS Utility website. 3. Appropriate identification and signage to be installed by plumbing contractor and verified during construction by producing the cross flow check certificate and plumbing inspection. 4. Appropriate pricing levels so recycled water is not significantly lower (20%) in cost than drinking water. 5. Flow monitoring to detect larger than normal flows. 6. Conservative AWTP log reduction targets based on Table 3.7 in AGWR (2006).	B	Unlikely	3	Moderate	Moderate

Project: **COBAKI ESTATE TWEED HEAD NSW**
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Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
	Loss of chlorine residual	Loss of chlorine residual due to long detention time, high temperature, high COD	Non-compliant recycled water	C	Possible	2	Moderate	Moderate	1. Chlorine dosing regime will be calibrated to ensure the minimum required free chlorine residual is maintained at the furthest point in the reticulation system. 2. 24/7 monitoring of free chlorine in the Recycled Water storages and throughout the reticulation system.	B	Unlikely	3	Moderate	Moderate
	Pipe breakage	Pipe breakage due to excavation or machinery that leads to surface runoff of recycled water	Potential contamination of surface waters	C	Possible	2	Minor	Moderate	1. PN16 HDPE pipe with welded joints and fittings. 2. Quality assurance and pressure testing during construction. 3. Above ground signage and identification tape in all trenches. 4. Register all work as executed plans with dial before you dig service and on the NWS Utility GIS. 5. Pressure and flow monitoring in the network to assist with detecting pipe breaks. 6. Visual inspection for wet, green, boggy areas or signs of soil erosion. 7. Customer fault reporting and response procedures in customer service. 8. Emergency Response Plan for main breaks. 9. All storm water at the site is treated using bio retention basins in the storm water treatment train.	B	Unlikely	2	Minor	Low
	Minor pipe leaks	Minor leaks from pipe joints and fittings	Potential contamination of groundwater	D	Likely	2	Minor	Moderate	1. PN16 HDPE pipe with welded joints and fittings. 2. Quality assurance and pressure testing during construction. 3. Visual inspection for green, wet and boggy areas. 4. Monitor flows throughout the network to identify water losses. 5. Use leak detection systems if required.	B	Unlikely	2	Minor	Low
Indoor uses on private lots for toilet flushing and washing machine cold water	Pathogens	Unintended uses	Potential public health impacts	B	Unlikely	2	Minor	Moderate	1. Class A+ recycled water with conservative log reduction targets. 2. Laundry washing machine cold water supply to be hard plumbed. 3. Residential customer supply contracts and recycled water use agreements. 4. Ongoing awareness and education with information provided at each billing cycle and on the NWS Water Utility website. 5. Appropriate identification and signage to be installed by plumbing contractor and verified during construction and plumbing inspection. 6. Appropriate pricing levels so recycled water is not significantly lower (20%) in cost than drinking water. 7. Flow monitoring to detect larger than normal flows.	B	Unlikely	3	Moderate	Moderate
Uncontrolled outdoor Recycled Water uses on private lots, i.e. irrigation, garden watering, water features, car washing and wash down uses.	Pathogens	Human contact and ingestion of spray drift or surface runoff	Potential public health impacts	B	Possible	2	Minor	Moderate	1. Conservative AWTP log reduction target based on Table 3.7 in AGWR (2006). 2. Customer supply contracts, recycled water use agreements and ongoing customer education and awareness.	B	Unlikely	1	Insignificant	Low
	Nutrients	Excessive nutrient loads in irrigation	Potential contamination of soil and groundwater	B	Unlikely	2	Minor	Moderate	1. AWTP treated recycled water contains low nutrients of TN<7 mg/L & TP<0.25 mg/L and under normal irrigation rates and recycled water availability should not result in excessive nutrient impacts. 2. Detailed soil monitoring will be undertaken annually on private land on the 3 biggest users of non-potable water in the scheme based on customer non-potable water meter readings. 3. If required customers will be advised to reduce irrigation rates or other management measure as per the recycled water supply agreement.	B	Unlikely	2	Minor	Low
	Salinity	Irrigation with high salt recycled water	Reduction in plant growth and poor appearance	B	Unlikely	2	Minor	Low	1. The AWTP includes a side stream using drinking water to maintain salt concentrations at around 500 mg/L TDS as per drinking water standards. 2. Irrigation at 500 mg/L TDS is unlikely to result in vegetation impacts, except for some specific species that may have very low tolerance to salt. 3. Customer supply contracts and recycled water use agreements will advise customers not to irrigate specific plants with very low tolerance to salt.	A	Rare	2	Minor	Low
		Wash down using high salt recycled water	Corrosion of customer private assets	B	Unlikely	2	Minor	Low	1. The AWTP includes a side stream reverse osmosis process to maintain salt concentrations at around 500 mg/L TDS as per drinking water standards.	A	Rare	2	Minor	Low

Project: **COBAKI ESTATE TWEED HEAD NSW**
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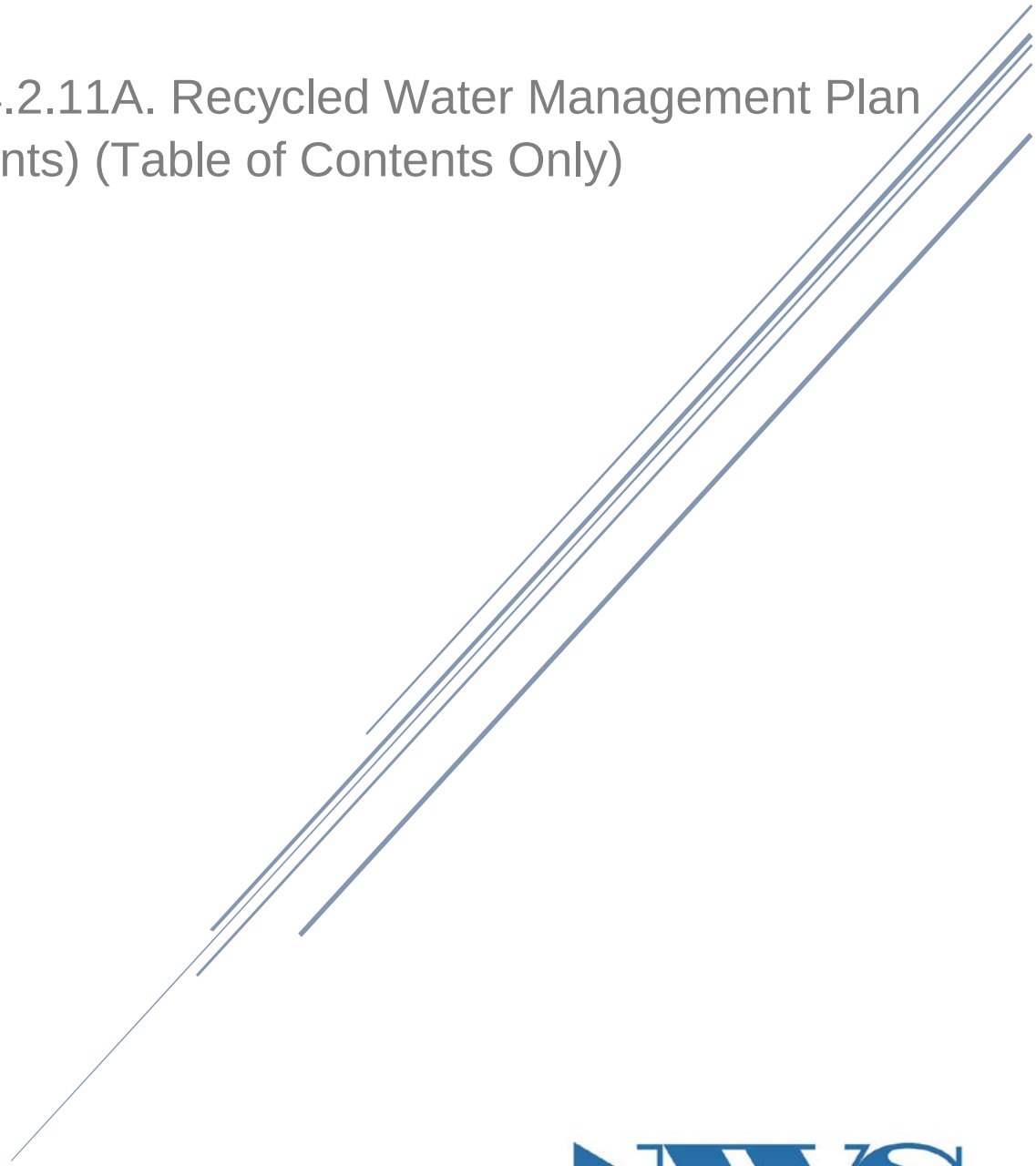
Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
	SAR	Irrigation with high SAR recycled water	Potential impacts on soil structure	B	Unlikely	2	Minor	Low	1. Sandy soil profile hence the sod city issues should not be significant. 2. Annual soil monitoring of Exchangeable Sodium Percent will be undertaken on the 3 biggest recycled water users based on customer recycled water meter records. 3. If required customers will be required to reduce irrigation rates or undertake a gypsum application based on the recycled water use agreement. 4. If required the SAR of the recycled water supply will be reduced to <5 through by addition of calcium and magnesium and/or by reducing sodium inputs.	A	Unlikely	2	Minor	Low
	pH	Irrigation with low or high pH recycled water	Long term pH impacts on soil	B	Unlikely	2	Minor	Low	1. Maintain pH between 6.5 and 8.5 as per drinking water standards. 2. Continuous online monitoring, control and alarms on pH correction system.	B	Unlikely	2	Minor	Low
		Wash down with high or low pH recycled water	Potential corrosion of private assets	B	Unlikely	2	Minor	Low		B	Unlikely	2	Minor	Low
	Chlorine	Irrigation using recycled water with high chlorine concentration	Potential impacts on vegetation and soil microorganisms	B	Unlikely	2	Minor	Low	1. Maximum free residual chlorine concentration of .6 mg/L. 2. Chlorine dosing systems have been installed and monitor the chlorine residual in the recycled water networks 24/7.	B	Unlikely	2	Minor	Low
	Trace metals, organic chemicals and other potential trace contaminants.	Trace contaminants present during irrigation	Potential impacts on soil and vegetation	B	Unlikely	2	Minor	Low	1. Majority residential catchment hence there is a low likelihood of significant trace contaminants being present in recycled water. 2. Customer supply contracts, recycled water use agreements and ongoing awareness and education through information provided with rates notices and via the NWS Utility Website. 3. Detailed annual recycled water quality monitoring for trace contaminants. 4. If contaminants are detected a source control investigation will be undertaken through analysis of trade waste and raw wastewater data. 5. If required additional treatment in the AWTP will be provided using reverse osmosis, activated carbon or ion exchange.	A	Unlikely	2	Minor	Low
Stage B ultimate Public Open Space Irrigation System	Cross connection with drinking water network	Cross connection between open space irrigation network and drinking water networks	Contamination of drinking water supplies	C	Likely	3	Moderate	Moderate	Cross connection control plan will be developed for the scheme and will include the following requirements for the Open Space Irrigation Network: 1. Water pressure in Open Space Irrigation Network to be maintained a minimum of 50 KPA pressure below the pressure in the drinking water network. 2. Unique pipe materials. Open Space Irrigation Network is to use Lilac PVC pipe or lilac striped HDPE piping. 3. Only approved, trained and supervised plumbing contractors are permitted to work on reticulation systems. 4. Monitoring of pressure and salinity differential between drinking water and recycled water networks	B	Unlikely	2	Moderate	Moderate
	Unintended uses or human contact with recycled water	Unintended uses or human contact with recycled water	Potential health impacts	C	Likely	3	Moderate	Low	1. Irrigation of high quality "Class A+" recycled water only 2. Above ground taps or fixtures in public open space irrigation areas must be lilac in color and labelled “not fit for drinking”. 3. Appropriate warning signage in all open space irrigation areas. 4. Lockable irrigation valves pits and controllers etc. 5. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall, high wind or elevated soil moisture. 6. Surface sprinklers with spray drift control including sprinkler nozzles that operate under low pressure with a large droplet size and low throw height.	A	Rare	3	Moderate	Low
	Spray drift during irrigation	Spray drift onto sensitive receptor	Potential ingestion of recycled water	E	Almost certain	3	Moderate	Low	1. Irrigation of high quality "Class A+" recycled water only. 2. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall, high wind or elevated soil moisture. 3. Surface sprinklers with spray drift control including sprinkler nozzles that operate under low pressure with a large droplet size and low throw height. 4. Proper signage installed in irrigation areas advising the public that recycled water is in use.	A	Rare	2	Minor	Low
	Irrigation during wet weather	Irrigation during wet weather resulting in surface runoff or deep percolation of effluent	Contamination of surface and/or ground waters	E	Almost certain	3	Moderate	High	1. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall, high wind or elevated soil moisture.	A	Rare	2	Minor	Low

Project: **COBAKI ESTATE TWEED HEAD NSW**
Client: **Leda Manor Stead**
Title: **Appendix 4.2.10 Recycled** Water Preliminary Risk Assessment for IPART Application
Author: WW
Date (Revision): 14/07/2016 (Revision C)
Risk Criteria: As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
	Irrigation rates and scheduling	Inappropriate irrigation scheduling	Increased risk of surface and ground water contamination	B	Possible	2	Minor	Low	1. Irrigation scheduling will use programmable irrigation controllers to control irrigation frequency, time and duration. Irrigation rates will be calibrated to ensure no ponding. 2. Irrigation rates will be seasonally adjusted in the irrigation controller to match seasonal irrigation demand.	B	Unlikely	2	Minor	Low
	Recycled water	Surface runoff during irrigation	Potential contamination of surface water	B	Possible	2	Moderate	Low	1. All irrigation areas to use irrigation scheduling controls to control the time, frequency and duration of irrigation events. 2. Soil moisture probes and weather station override on irrigation controllers to prevent irrigation during rainfall or elevated soil moisture. 3. Site based storm water runoff and environmental controls.	B	Unlikely	2	Minor	Low
	Nitrogen	Excessive nitrogen load resulting in leaching of nitrate from irrigation areas	Contamination of groundwater	B	Unlikely	2	Moderate	Low	1. Irrigation of "Class A+" recycled water with total nitrogen concentration of 7 mg/L and low average irrigation rates of around 0.9 mm/day. 2. Modelling indicates all nitrogen applied in irrigation is taken up by vegetation. 3. Modelling indicates negligible nitrate concentration in deep drainage.	B	Unlikely	2	Minor	Low
Stage B ultimate Public Open Space Irrigation System continued…	Phosphorus	Excessive phosphorous load resulting in leaching of phosphate from irrigation area	Contamination of groundwater	B	Unlikely	2	Moderate	Low	1. Irrigation of "Class A+" recycled water with total phosphorus concentration of 0.25 mg/L and low average irrigation rates of around 0.9 mm/day. 2. Water balance modelling indicates the majority of phosphorus applied in irrigation is taken up by vegetation. 3. Water balance modelling indicates negligible phosphate concentration in deep drainage. 4. Water balance modelling predicted Phosphorus adsorption into soil at a low rate of 0.3 kg/ha/year.	B	Unlikely	2	Minor	Low
	Effluent Salinity	Impacts on plant growth due to salinity	Reduction in plant growth and water and nutrient uptake rates	B	Unlikely	2	Minor	Low	1. Water balance modelling indicated no impacts on plant growth due to salinity based on a conservative effluent TDS of 500 mg/L. 2. Landscape design processes will ensure appropriate vegetation is selected in temporary irrigation areas that can tolerate the required salt concentrations. 3. The top soil profile and relatively high rainfall at the site will assist with flushing of salt through the soil profile to minimize potential salinity impacts on vegetation.	B	Unlikely	2	Minor	Low
	Effluent SAR	Long term sod city impacts on soil	Soil dispersion, reduction in permeability	B	Unlikely	2	Minor	Moderate	1. Topsoil profile report hence the likelihood of sod city impacts is low. 2. Detail geotechnical testing to be undertaken for each development stage will avoid areas with high clay content and Exchangeable Sodium Percentage (ESP). 3. Ongoing monitoring of soil cations will detect changes in soil ESP over time. 4. If required gypsum/lime application to irrigation areas will be undertaken. 5. If required the irrigation water SAR will be adjusted through addition of calcium/magnesium or reduction in sodium inputs to maintain effluent SAR<5.	B	Unlikely	2	Minor	Low
	Metals and trace contaminants	Trace contaminants is irrigation supply resulting in long term accumulation in irrigation area	Contamination of soil and groundwater	B	Unlikely	2	Minor	Low	1. Source catchment is >99% domestic wastewater hence the likelihood of trace contaminants is low. 2. Customer awareness campaigns, supply contracts, trade waste agreements and recycled water use agreements will further reduce the likelihood of events occurring. 3. Detailed monitoring of effluent quality for trace contaminant will be undertaken annually using a NATA accredited laboratory. 4. Soil monitoring in open space irrigation area will identify any build up or increase in contaminants. 5. If contaminants are detected then an investigation into the likely source will be undertaken and trade waste/source controls implemented.	B	Unlikely	2	Minor	Low
	Recycled water	Pipe breakage	Potential contamination of surface or groundwater	C	Possible	2	Minor	Moderate	1. Flow and pressure monitoring in the irrigation supply system. 2. Visual inspection to identify boggy areas or erosion etc. 3. Fault and main break reporting system through customer service processes.	B	Unlikely	2	Minor	Low
	Odor	Odor released during	Odor impacts on	B	Unlikely	2	Minor	Low	1. Irrigation of high quality "Class A+" recycled water with low BOD	A	Rare	2	Minor	Low

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
		irrigation	nearby residents											
	Storm water run on	Storm water running onto irrigation areas from up gradient	Water logging of irrigation area	D	Likely	2	Minor	Moderate	1. Storm water diversion drains to divert all up gradient storm water runoff around effluent irrigation areas. 2. Appropriate buffers to waterways, ponds, storm water drains and SEPP14 wetlands	A	Rare	2	Minor	Low
	Percolation to groundwater	Excessive percolation of effluent to groundwater	Contamination of groundwater	C	Possible	3	Moderate	Moderate	1. Low long term average irrigation rate of approximately 0.9 mm/day, hence low risk of groundwater contamination. 2. Minimal presence of groundwater within 3 meters of ground surface is geotechnical investigation. 3. High quality effluent with low nutrients. 4. Water balance modelling indicates negligible concentrations of nutrients in deep drainage for conservative soil profile. 5. A minimum of 600mm sandy loam topsoil cover will be provided on irrigation areas if there is potential for seasonal high water table.	B	Unlikely	2	Minor	Low

Appendix 4.2.11A. Recycled Water Management Plan (12 Elements) (Table of Contents Only)



Cobaki Estate Development Tweed Heads, NSW

Recycled Water Quality Management Plan

August 2016

Appendix **4.2.11**

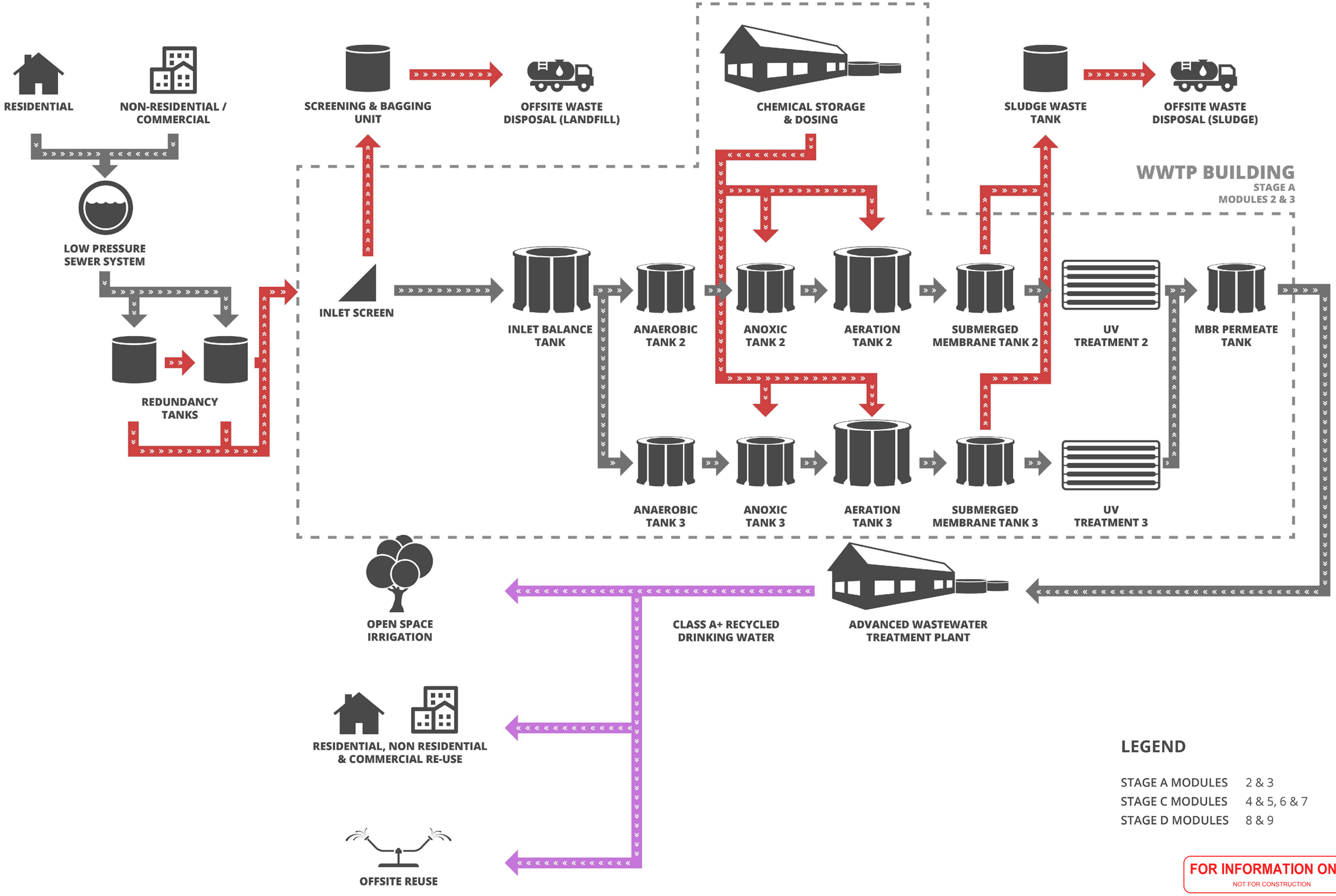
Table of Contents

Tables

Figures

Appendices

Appendix 4.3.1A. Sewerage PFD’S



LEGEND

STAGE A MODULES	2 & 3
STAGE C MODULES	4 & 5, 6 & 7
STAGE D MODULES	8 & 9

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B	ISSUED FOR INFORMATION	25-08-2016	CW	WW	AW	

SCALES:
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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
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Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429
www.wgmconsulting.com.au

CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

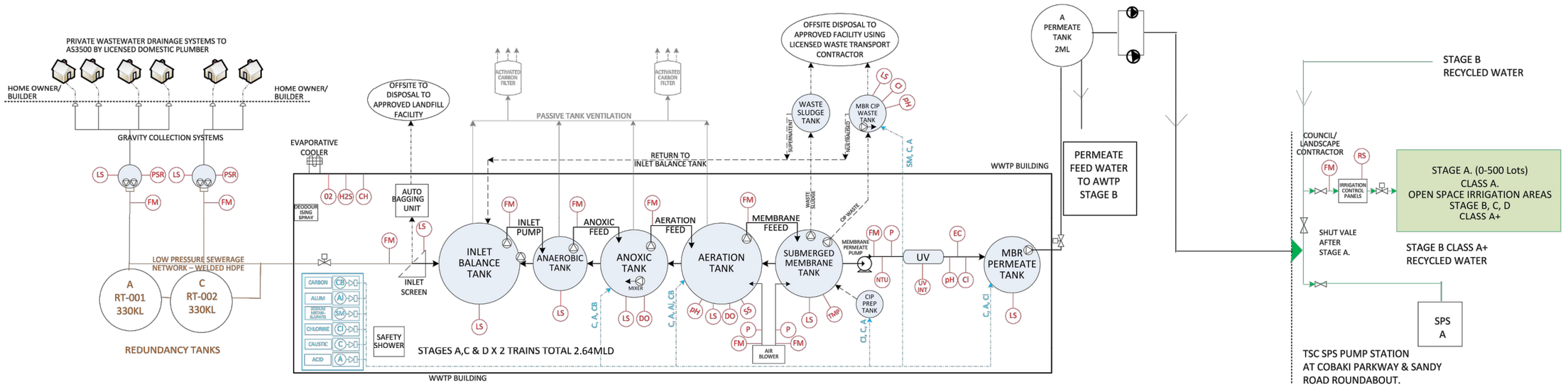
DRAWING TITLE:
WASTE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 1A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0430	C

COBAKI PROCESS FLOW DIAGRAM

STAGE A, C & D MBR WASTEWATER TREATMENT PLANT

Membrane Bioreactor Peak Design Capacity 2.64MLD



LOW PRESSURE SEWERAGE SYSTEM

- WASTEWATER WILL DRAIN THROUGH A GRAVITY SEWERAGE COLLECTION SYSTEMS TO A NUMBER OF DUPLEX LOW PRESSURE SEWAGE PUMP STATIONS THAT SERVICE 1 TO 4 LOTS EACH.
- WASTEWATER IS PUMPED IN A CONTROLLED MANNER THROUGH THE LOW PRESSURE SEWERAGE NETWORK TO THE REDUNDACY TANK AT THE WWTP. OPERATION OF THE PRESSURE SEWER NETWORK PUMPS IS CONTROLLED BY THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP TO CONTROL PEAK INFLOWS TO THE MBR.
- LOW PRESSURE SEWER NETWORK TO BE CONSTRUCTED WITH BROWN-STRIPED PN 16 HDPE PIPE WITH WELDED PIPE JOINTS AND FITTINGS.
- EACH LOW PRESSURE SEWERAGE PUMP STATION WILL INCLUDE:
  - PUMP HEAD AND FLOW CAPACITY TO SERVICE BETWEEN 1 AND 4 LOTS.
  - DUTY AND STANDBY PUMPS WITH ONLINE FAULT DETECTION AND ALARMS.
  - 24 HOURS EMERGENCY STORAGE CAPACITY IN THE WET WELL.
  - HARD WIRED COMMUNICATION CABLING BACK TO THE DIRECT DIGITAL CONTROL SYSTEM AT THE WWTP.
  - CONTINUOUS ONLINE WET WELL WATER LEVEL AND FLOW MONITORING WITH ALARMS.
  - AUTOMATED SYSTEM START-UP AND RECOVERY FOLLOWING POWER OUTAGE VIA THE DIRECT DIGITAL CONTROL SYSTEM.
  - ADDITIONAL ONLINE WATER QUALITY MONITORING PROBES, E.G. PH, TDS, NTU, FOR DETECTION OF INAPPROPRIATE CHEMICAL DISPOSAL OR TRADE WASTE PRACTICES, DURING OPERATION.

STAGE A,C,& D WASTEWATER TREATMENT PLANT – MEMBRANE BIOREACTOR

- ALL WASTEWATER TREATED IN THE MEMBRANE BIOREACTOR TO PRODUCE "CLASS A" RECYCLED WATER SUITABLE FOR CONTROLLED IRRIGATION . MBR TARGET EFFLUENT QUALITY:
  - BIOCHEMICAL OXYGEN DEMAND < 10 mg/L
  - SUSPENDED SOLIDS < 10 mg/L
  - TOTAL NITROGEN < 10 mg/L
  - TOTAL PHOSPHOROUS < 0.3 mg/L
  - pH 6.5 TO 8.5
  - FAECAL COLIFORMS < 10 cfu/100 mL
- PEAK DESIGN CAPACITY OF MBR PROCESS TRAIN IS 600kL PER MODULE X4

THE ADVANCED WATER TREATMENT PLANT TO PRODUCE "CLASS A+ RECYCLED WATER" WILL BE OPERATIONAL ONCE 500 LOTS ARE CONNECTED TO THE SYSTEM IN STAGE B.

- OPERATION OF THE WWTP IS FULLY AUTOMATED AND INTEGRATED WITH OPERATION OF THE PRESSURE SEWER NETWORK TO CONTROL PEAK FLOWS INTO THE MBR USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ALL ON LINE MONITORING, CONTROL AND ALAM SYSTEM CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR LATER REVIEW AND TROUBLE SHOOTING.

STAGE A EFFLUENT MANAGEMENT SYSTEM

- AN IRRIGATION MANAGEMENT PLAN AND RECYCLED WATER MANAGEMENT PLAN WILL BE DEVELOPED FOR THE SCHEME THAT WILL OUTLINE SITE SPECIFIC IRRIGATION, ENVIRONMENTAL AND PUBLIC HEALTH CONTROL MEASURES FOR EACH IRRIGATION AREA. TYPICAL IRRIGATION CONTROLS WILL INCLUDE:
  - IRRIGATION CONTROLLERS TO CONTROL THE TIME, FREQUENCY AND DURATION OF IRRIGATION EVENTS.
  - RAIN-SENSOR OVERRIDE ON IRRIGATION CONTROLLERS AND IRRIGATION SUPPLY PUMP TO PREVENT IRRIGATION DURING OR SHORTLY AFTER RAIN.
  - SUBSURFACE IRRIGATION IN WITHIN 20 METRES OF IDENTIFIED SENSITIVE RECEPTORS.
  - SPRAY DRIFT CONTROLS ON SURFACE IRRIGATION SYSTEMS.
  - APPROPRIATE BUFFER DISTANCES TO WATERWAYS, SEPP 14 WETLANDS AND OTHER SENSITIVE RECEPTORS.
  - CROSS CONNECTION CONTROLS INCLUDING UNIQUE PIPE MATERIALS, BACKFLOW PREVENTION AND PRESSURE MANAGEMENT.
  - IRRIGATION AT NIGHT TO MINIMISE POTENTIAL FOR HUMAN CONTACT.
  - APPROPRIATE WARNING SIGNS AND IDENTIFICATION AND LABELLING.

NOTE:
DURING STAGE A. CLASS A. TREATED EFFLUENT WILL BE USED TO DEVELOP THE 20HA OF OPEN SPACE AND SPORTS FIELDS BY CONTTROLLED IRRIGATION SYSTEM. EXCESS TREATED.
EFFLUCENT DURING WET WEATHER EVENTS WILL BE DISCHARGED TO THE NEW SP5 LOCATED AT COBAKI PARKWAY & SANDY ROAD ROUNDABOUT WHICH IS CONNECTED TO THE EXISTING TSC NETWORK.
STAGE B.
RECYCLED WATER WILL BE USED ONLY ON THE OPEN SPACE & SPORTS FIELD AREA'S AND ANY EXCESS ? WILL BE DISCHARGED TO THE TSC SPS.
REFER TO THE WATER BALANCE REPORT FOR MORE DETAILS .

LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- PSR PUMP STARTS AND RUN HOURS
- LS WATER LEVEL
- DO DISSOLVED OXYGEN
- SS MIXED LIQUOR SUSPENDED SOLIDS
- pH pH
- Cl FREE CHLORINE RESIDUAL
- NTU TURBIDITY
- TMP TRANSMEMBRANE PRESSURE
- UV INT UV INTENSITY
- EC ELECTRICAL CONDUCTIVITY
- RS RAIN SENSOR
- CH METHANE GAS
- H2S HYDROGEN SULPHIDE GAS
- 02 OXYGEN GAS

PROCESS EQUIPMENT

- INLET SCREEN
- MEMBRANE BIOREACTOR PROCESS TANKS
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- HOUSEHOLD SEWERAGE CONNECTION POINT
- EVAPORATIVE AIR CONDITIONING UNIT

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- CB ACETIC ACID (CARBON) DOSING AS SUPPLEMENTARY FOOD SOURCE
- Al POLYALUMINIUM CHLORIDE DOSING FOR PHOSPHORUS REMOVAL
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

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www.wgmconsulting.com.au
CONSULTING

CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
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PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

DRAWING TITLE:
WASTE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 1B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
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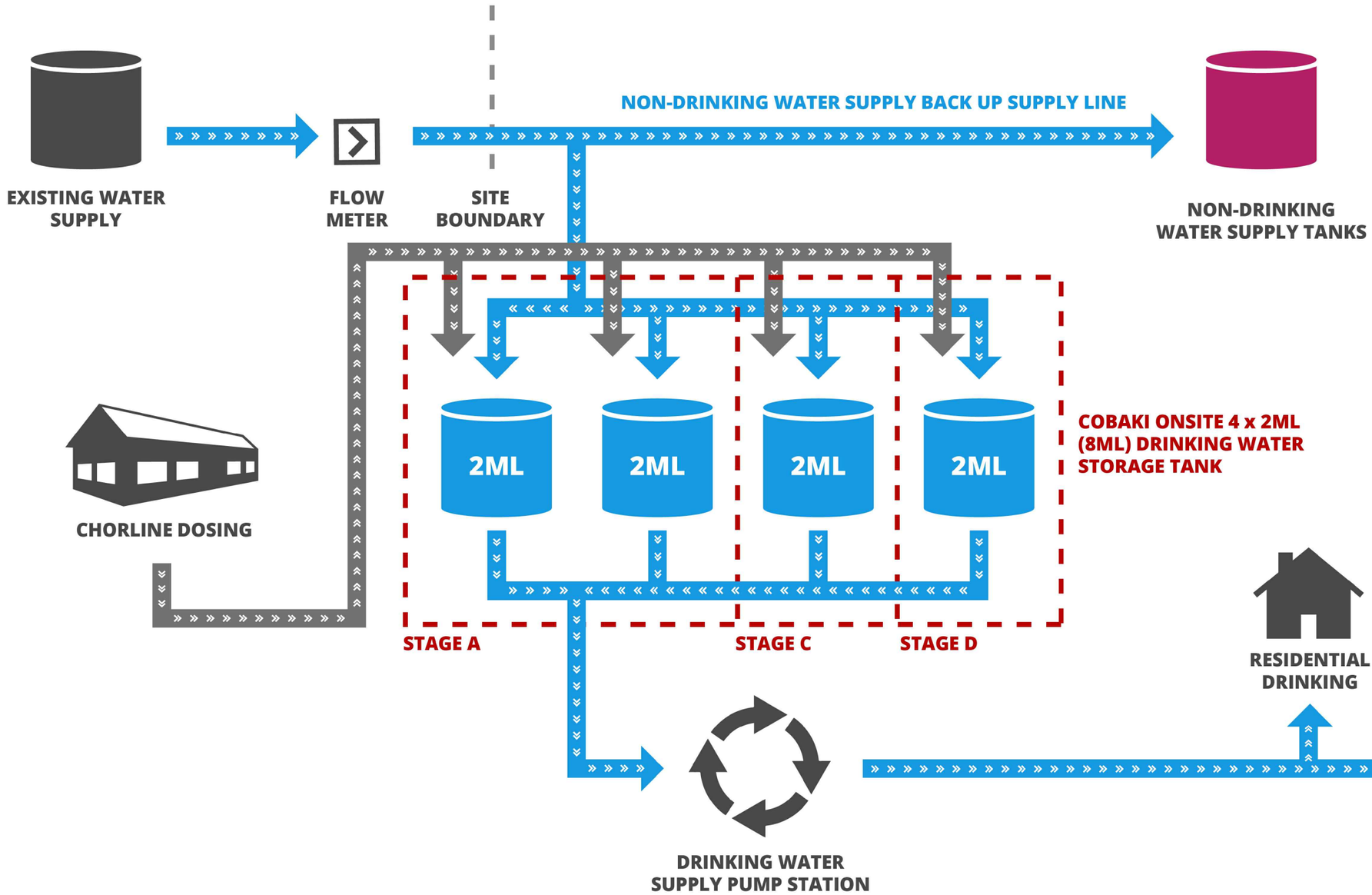

TOTAL 8ML

STAGE A - 2 x 2ML
STAGE C - 1 x 2ML
STAGE D - 1 x 2ML

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PROJECT:
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PIGGABEEN ROAD
NSW
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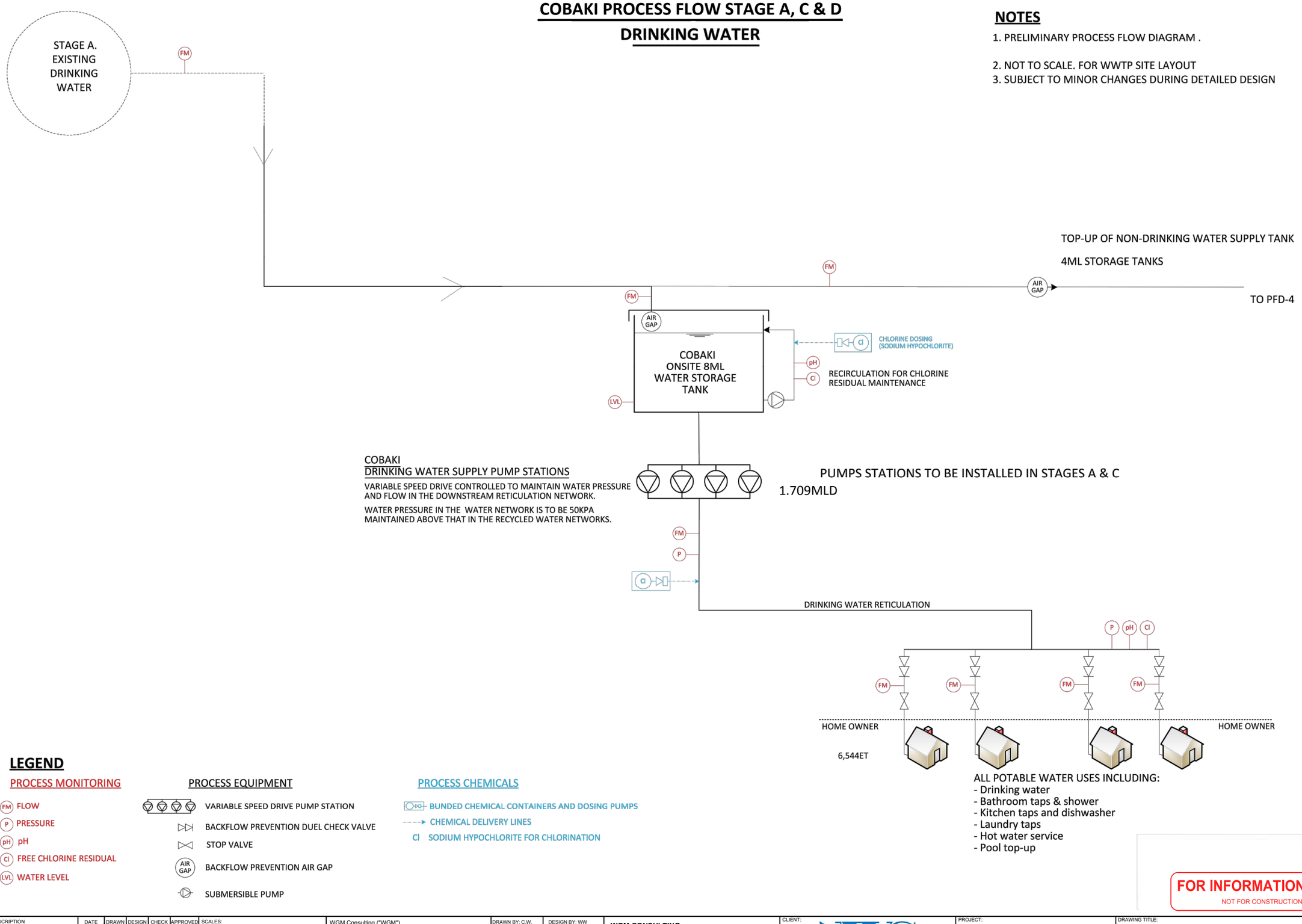
DRAWING TITLE:
DRINKING WATER
PROCESS FLOW DIAGRAM 2A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0432	C

COBAKI PROCESS FLOW STAGE A, C & D
DRINKING WATER

NOTES

1. PRELIMINARY PROCESS FLOW DIAGRAM .
2. NOT TO SCALE. FOR WWTP SITE LAYOUT
3. SUBJECT TO MINOR CHANGES DURING DETAILED DESIGN



LEGEND

PROCESS MONITORING

- FM FLOW
- P PRESSURE
- pH pH
- Cl FREE CHLORINE RESIDUAL
- LVL WATER LEVEL

PROCESS EQUIPMENT

- VARIABLE SPEED DRIVE PUMP STATION
- BACKFLOW PREVENTION DUEL CHECK VALVE
- STOP VALVE
- AIR GAP BACKFLOW PREVENTION AIR GAP
- SUBMERSIBLE PUMP

PROCESS CHEMICALS

- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- Cl SODIUM HYPOCHLORITE FOR CHLORINATION

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DRAWING TITLE:
DRINKING WATER
PROCESS FLOW DIAGRAM 2B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
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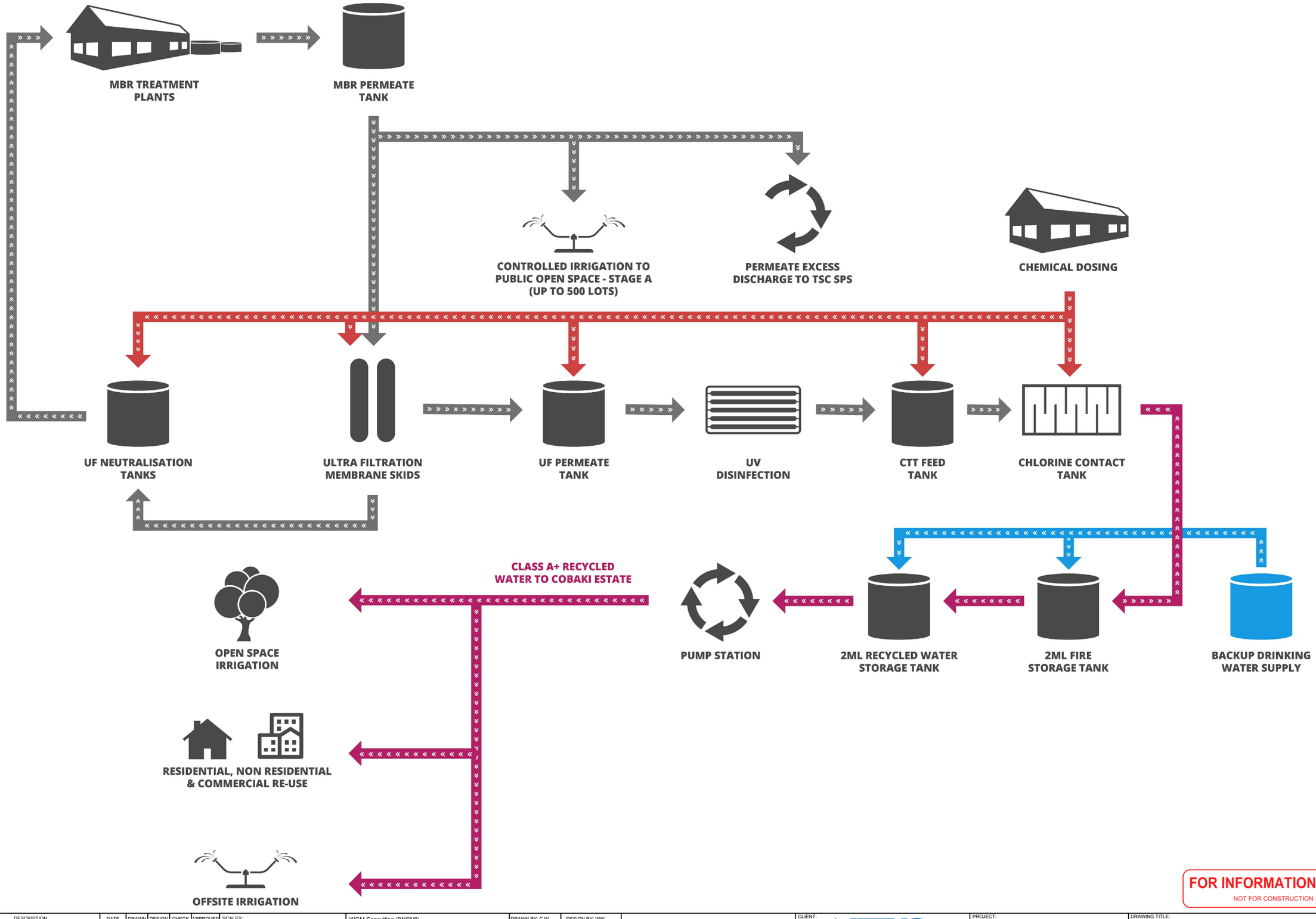

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SCALES:

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
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www.wgmconsulting.com.au

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PROJECT:

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PIGGABEEN ROAD
NSW

TWEED SHIRE COUNCIL

DRAWING TITLE:

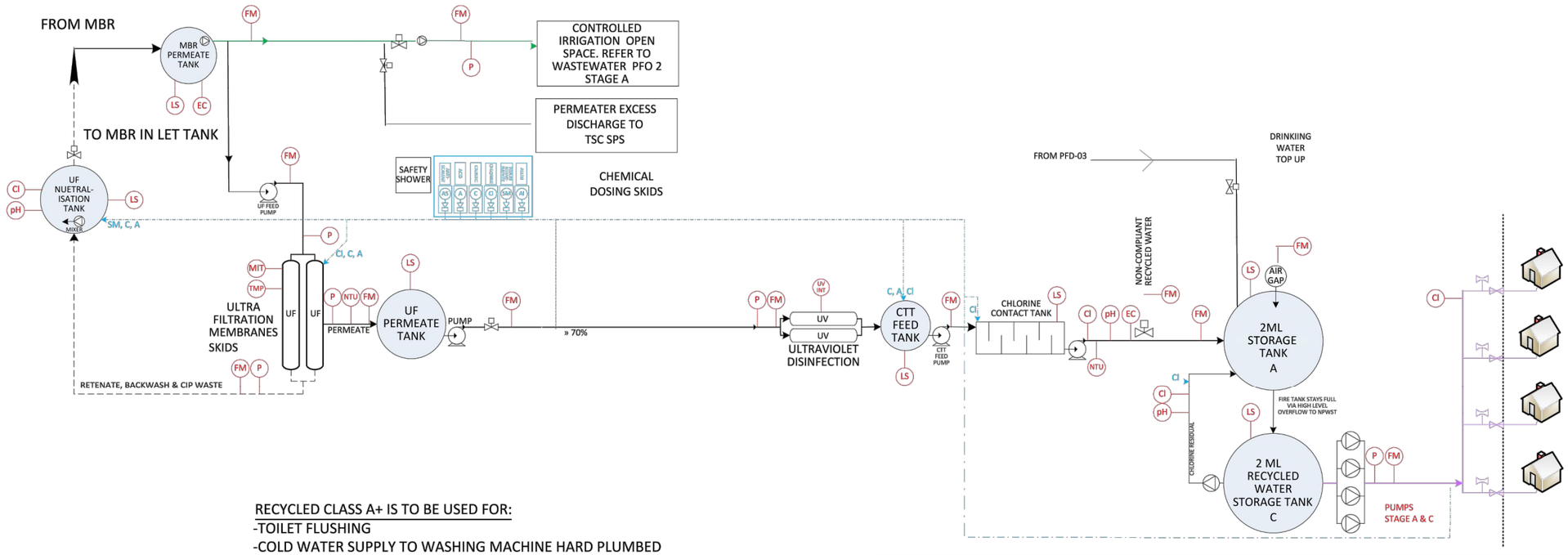
ADVANCED WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 3A

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0434	C

COBAKI PROCESS FLOW DIAGRAM

STAGE B ADVANCED WATER TREATMENT PLANT

CLASS A+ RECYCLED WATER



RECYCLED CLASS A+ IS TO BE USED FOR:
-TOILET FLUSHING
-COLD WATER SUPPLY TO WASHING MACHINE HARD PLUMBED
-HOME & INDUSTRIAL WASHDOWN
-CAR WASHING
-GARDEN & LAWN WATERING
-WATER FEATURES
-OPEN SPACE AREA'S & SPORTS FIELD , GOLF COURSE
-COMMERCIAL USES NURSRIES ETC
-INDUSTRIAL COOLING TOWERS CONCRETE PRODUCTION, DUST SUSPRESSION FOR CONSTRUCTION SITES & ROAD BUILDING.

LEGEND

PROCESS MONITORING

- FM FLOW METRE
- P PRESSURE
- LS WATER LEVEL
- EC ELECTRICAL CONDUCTIVITY
- TMP TRANSMEMBRANE PRESSURE
- MIT MEMBRANE INTEGRITY TEST
- NTU TURBIDITY
- UV INT UV INTENSITY
- pH pH
- CI FREE CHLORINE RESIDUAL

PROCESS EQUIPMENT

- ADVANCED WATER TREATMENT PLANT PROCESS TANKS
- ULTRAFILTRATION MEMBRANE SKID
  NOMINAL MEMBRANE PORE SIZE 0.03 UM
  INTEGRITY TESTING BY PRESSURE DECAY
  USEPA ACCREDITED MEMBRANES SUPPLIED BY X-FLOW
- ULTRAVIOLET DISINFECTION SYSTEM
  SELF CLEANING SYSTEM WITH UV INTENSITY MONITORING
  NOMINAL UV DOSE OF 90 J/m2 @ UV TRANSMISSION OF 50%
  USEPA ACCREDITED UV DISINFECTION SYSTEM SUPPLIED BY ORICA
- CHLORINE CONTACT TANK
  CONTACT TANK WILL BE DESIGNED TO USEPA GUIDELINES TO ACHIEVE CT VALUES FOR THE REQUIRED LOG REMOVAL TARGETS.
- SUBMERSIBLE PUMP
- DRY-MOUNTED PUMP
- MIXING PUMP
- MOTORISED VALVE
- MANUAL VALVE
- EVAPORATION MISTING SPRAYERS

PROCESS CHEMICALS

- BUNDED CHEMICAL STORAGE AREA
- BUNDED CHEMICAL CONTAINERS AND DOSING PUMPS
- CHEMICAL DELIVERY LINES
- AS REVERSE OSMOSIS MEMBRANE ANTISCALENT
- CI SODIUM HYPOCHLORITE FOR CHLORINATION
- SM SODIUM METABISULPHIDE DOSING FOR DECHLORINATION
- C SODIUM HYDROXIDE (CAUSTIC) FOR pH CORRECTION AND MEMBRANE CLEANING
- A HYDROCHLORIC ACID FOR pH CORRECTION AND MEMBRANE CLEANING

STAGE B WWTP – ADVANCED WATER TREATMENT PLANT

- THE ADVANCED WATER TREATMENT PLANT (AWTP) WILL BE COMMISSIONED ONCE 500 LOTS HAVE BEEN CONNECTED TO THE SYSTEM.
- THE AWTP IS SIZED TO PRODUCE 2.4 MLDAY OF CLASS A+ RECYCLED WATER SUITABLE FOR SUPPLY IN THE DUAL RETICULATION SYSTEM FOR DOMESTIC RE-USE
- LOG REDUCTION TARGETS FOR THE AWTP BASED ON TABLE 3.7 IN THE NATIONAL GUIDELINES FOR WATER RECYCLING (EPHC: 2006) ARE:
  - BACTERIA: >5.3 LOG REDUCTION
  - VIRUSES: >6.5 LOG REDUCTION
  - PROTOZOAN: >5.1 LOG REDUCTION
- LOG REDUCTION TARGETS WILL BE ACHIEVED USING ULTRAFILTRATION MEMBRANES, ULTRAVIOLET DISINFECTION AND CHLORINE CONTACT TANK. ALL PROCESSES AND EQUIPMENT USED TO ACHIEVE LOG REDUCTION TARGETS WILL BE ACCREDITED TO USEPA GUIDELINES AND VALIDATED ONSITE PRIOR TO COMMENCEMENT OF SUPPLY OF RECYCLED WATER FOR DOMESTIC USE
- PRIOR TO COMMISSIONING AND VALIDATION OF THE AWTP DURING STAGE B DRINKING WATER WILL BE USED TO SUPPLY THE DUAL RETICULATION SYSTEM.
-
- OPERATION OF THE AWTP IS FULLY AUTOMATED AND INTEGRATED WITH THE OPERATION OF THE DUAL RETICULATION SYSTEM USING THE DIRECT DIGITAL CONTROL SYSTEM.
- ALL ONLINE MONITORING, CONTROL AND ALARM SYSTEMS CAN BE REMOTELY ACCESSED THROUGH THE INTERNET. ALL DATA IS LOGGED FOR REVIEW AND TROUBLE SHOOTING.
- THE AWTP IS DESIGNED TO AUTOMATICALLY SHUT DOWN IF NON-COMPLIANT RECYCLED WATER IS DETECTED THROUGH CONTINUOUS ONLINE MONITORING.
- THE NON-DRINKING WATER STORAGE TANK PROVIDES IN APPROXIMATELY 3-DAY STORAGE AT PEAK RECYCLED WATER DEMANDS. THE DUAL RETICULATION SYSTEM WILL BE SUPPLEMENTED BY A DRINKING WATER TOP-UP DURING PERIODS OF EXTENDED PEAK DEMAND IF REQUIRED

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REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR INFORMATION	17-08-2016	CW	WW	AW	-
B	ISSUED FOR INFORMATION	25-08-2016	CW	WW	AW	

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES
DO NOT SCALE FROM DRAWING

DRAWN BY: C.W. | DESIGN BY: WW
APPROVED BY:
DATE:
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WGM CONSULTING
Suite 9a, 80-84 Ballina Street
P.O. Box161
Lennox Head NSW 2478
T 02 6687 4666
ABN:59210741429
www.wgmconsulting.com.au
CONSULTING

CLIENT:
NORTHERN WATER SOLUTIONS
PO BOX 977
NOOSA HEADS, QLD 4567

PROJECT:
COBAKI ESTATE
PIGGABEEN ROAD
NSW
TWEED SHIRE COUNCIL

DRAWING TITLE:
ADVANCED WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM 3B

ORIGINAL SIZE:	WGM JOB No.:	DRAWING No.:	REV:
A1	J116	0435	C

Appendix 4.3.1B. Sewerage Management Plan

(Table of Contents Only)

Cobaki Estate Development Tweed Heads, NSW

Onsite Wastewater Management Plan

September 2016

Appendix **4.3.1(B)**

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Tables

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Appendix 4.3.1C. Pressure Sewer Master Plan Report (Table of Contents Only)

Cobaki Estate – Pressure Sewer Master Plan Report

Northern Water Solutions Pty Ltd

WGM Consulting

Date: 08 August 2016

Document No.: J116 – RPT005 – Rev00

Document Status

Version	Document type	Reviewed by	Checked by	Date Issued
Rev 01	Report	S Robinson	A.Wells	

Project Details

Project Name:	Cobaki Estate – Pressure Sewer Master Plan Report
Client	Northern Water Solutions Pty Ltd
Client Project Manager	Wayne Williamson
Authors	Andrew Wells
WGM Reference:	J116

WGM Consulting
ABN 59 210 741 429
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
wgm@wgmconsulting.com.au

This report has been produced by Planit Engineering Pty Ltd, formerly WGM Consulting, all findings and assessments provided within this report have been made by Planit Engineering.

Contents

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Glossary

ADWF	Average Daily Dry Weather Flow
AWWF	Average Daily Wet Weather Flow
ET	Equivalent tenement = Number of equivalent dwellings
Ha	Hectare
I&I	Inflow and Infiltration
LPS	Low Pressure Sewer
PE	Polyethylene
PSS	Pressure Sewerage System
PSU	Pressure Sewer Unit
PVC	Polyvinyl chloride
SPS	Sewage Pumping Station
SRM	Sewerage Rising Main
WWTP	Sewage Treatment Plant
AWTP	Advanced Water Treatment Plant
TDH	Total dynamic head
WAE	Work as executed
TSC	Tweed Shire Council
TDH	Total Dynamic Head
GCCC	Gold Coast City Council
MBR	Membrane Bio Reactor

Appendix 4.3.1D. Pressure Sewer Master Plan

LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
- SCHOOL / UTILITIES
- OPEN SPACE
- ENVIRONMENTAL PROTECTION AREA
- COVENANT PROTECTED AREA
- STRUCTURED OPEN SPACE
- DAM
- PROPOSED COMMUNITY FACILITIES
- INDICATIVE HIGH LEVEL PRESSURE ZONE
- POTABLE WATER SUPPLY LINE
- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN

DETAIL SHEET 1

DETAIL SHEET 2

DETAIL SHEET 3

DETAIL SHEET 4

DETAIL SHEET 5

QUEENSLAND

NEW SOUTH WALES

WWTP SITE

PIGGABEEN ROAD

COBAKI CREEK

N

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REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK	APPROVED
A	ISSUED FOR INFORMATION	07-07-16	DH	-	AW	-
B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-
C	ISSUED FOR INFORMATION	21-10-16	CW	CW	AW	-

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LENGTHS ARE IN METRES

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PLANIT ENGINEERING
SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:

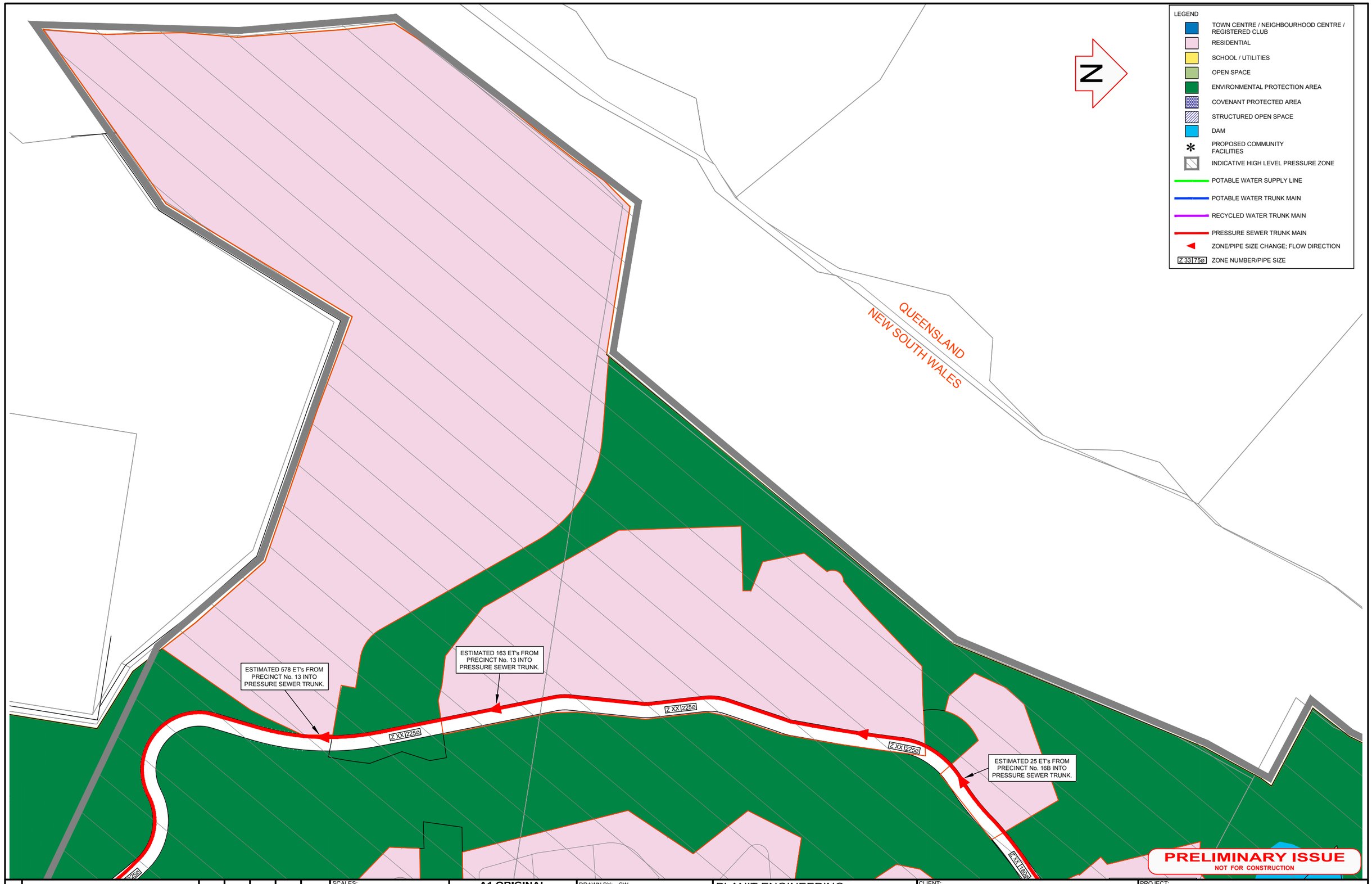
NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
PRESSURE SEWER SCHEME
OVERALL LAYOUT

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0018	C



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C	ISSUED FOR INFORMATION	21-10-16	CW	CW	AW	-

SCALES:

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LENGTHS ARE IN METRES

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SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT:

NWS
NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY:
TWEED SHIRE COUNCIL

PROJECT:
COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
PRESSURE SEWER SCHEME
DETAILED SHEET 1 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0019	C

LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
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- POTABLE WATER SUPPLY LINE
- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN
- ZONE/PIPE SIZE CHANGE; FLOW DIRECTION
- Z 33 75ø ZONE NUMBER/PIPE SIZE

N

ESTIMATED 578 ET's FROM PRECINCT No. 13 INTO PRESSURE SEWER TRUNK.

ESTIMATED 163 ET's FROM PRECINCT No. 13 INTO PRESSURE SEWER TRUNK.

Z XX 225ø

Z XX 225ø

ESTIMATED 200 ET's FROM PRECINCT No. 11 INTO PRESSURE SEWER TRUNK.

Z XX 225ø

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Z XX 225ø

Z XX 225ø

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Z XX 225ø

Z XX 225ø

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Z XX 225ø

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Z XX 225ø

Z XX 225ø

Z XX 225ø

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Z 45 160ø

PRELIMINARY ISSUE
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C	ISSUED FOR INFORMATION	21-10-16	CW	CW	AW	-

SCALES:

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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
LENGTHS ARE IN METRES

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SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT: NWS NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
PRESSURE SEWER SCHEME
DETAILED SHEET 2 OF 5

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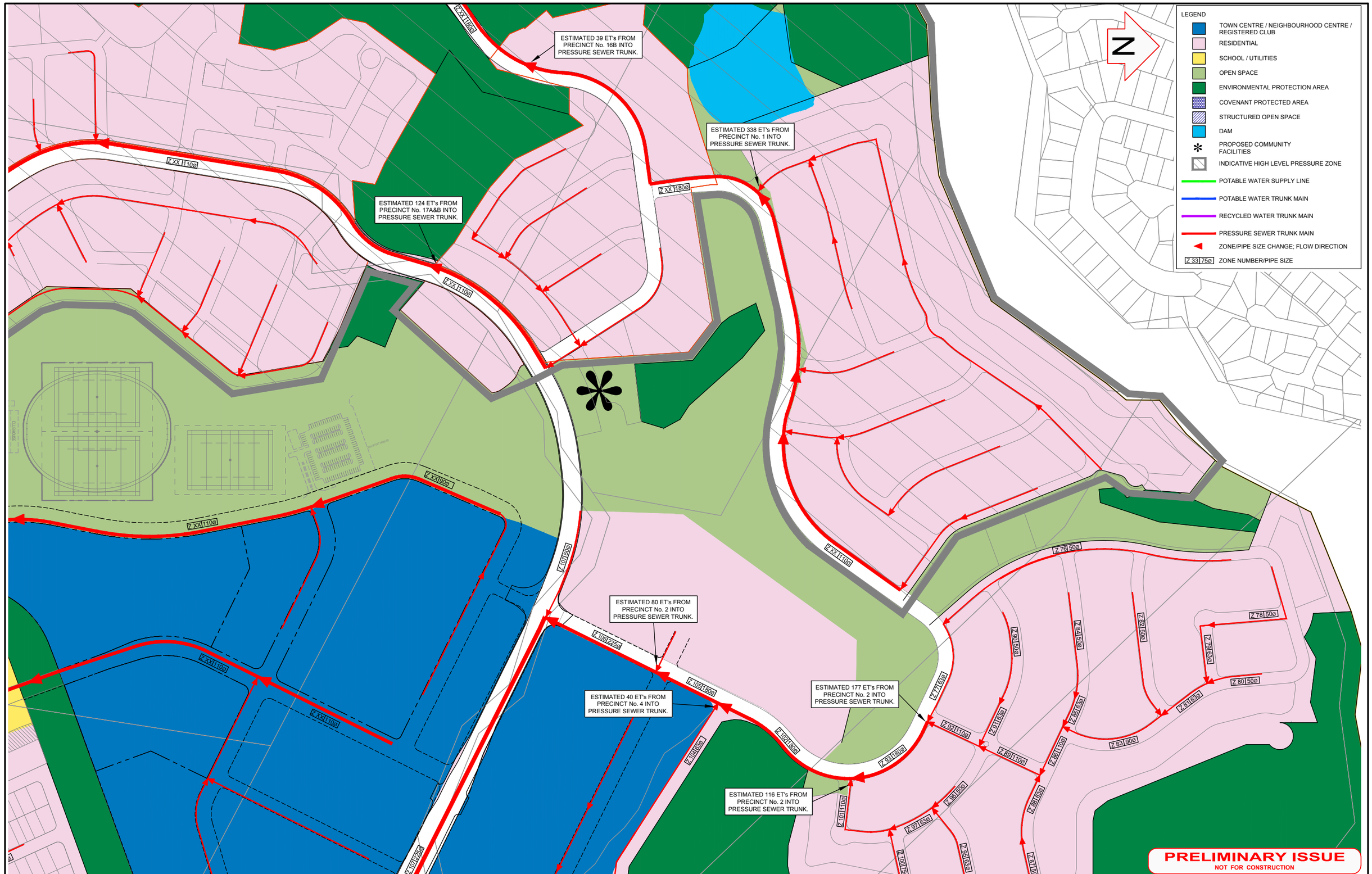

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PLANIT ENGINEERING
SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT: NWS NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE

DRAWING TITLE: SERVICING MASTER PLANS
PRESSURE SEWER SCHEME
DETAILED SHEET 3 OF 5

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ESTIMATED 156 ET's FROM PRECINCT No. 8 INTO PRESSURE SEWER TRUNK.

ESTIMATED 103 ET's FROM PRECINCT No. 7&8 INTO PRESSURE SEWER TRUNK.

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LEGEND

- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
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- POTABLE WATER TRUNK MAIN
- RECYCLED WATER TRUNK MAIN
- PRESSURE SEWER TRUNK MAIN
- ZONE/PIPE SIZE CHANGE; FLOW DIRECTION
- Z 33 75ø ZONE NUMBER/PIPE SIZE

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B	ISSUED FOR INFORMATION	12-10-16	CW	CW	AW	-
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FULL SIZE 1:500 ; HALF REDUCTION 1:1000
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SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT: NWS NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE

DRAWING TITLE:
SERVICING MASTER PLANS
PRESSURE SEWER SCHEME
DETAILED SHEET 4 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
A1	J116	0022	C

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- TOWN CENTRE / NEIGHBOURHOOD CENTRE / REGISTERED CLUB
- RESIDENTIAL
- SCHOOL / UTILITIES
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- ZONE/PIPE SIZE CHANGE; FLOW DIRECTION
- Z 33 75ø ZONE NUMBER/PIPE SIZE

PRELIMINARY ISSUE
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C	ISSUED FOR INFORMATION	21-10-16	CW	CW	AW	-

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LENGTHS ARE IN METRES

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SUITE 9A, 80-84 BALLINA STREET
PO BOX 161
LENNOX HEAD NSW 2478

TELEPHONE: 02 6687 4666
ABN: 99 613 049 568
EMAIL: admin@planitengineering.com.au

CLIENT: NWS NORTHERN WATER SOLUTIONS
PO BOX 977 NOOSA HEADS, QLD 4567

LOCAL GOVERNMENT AUTHORITY: TWEED SHIRE COUNCIL

PROJECT: COBAKI ESTATE

DRAWING TITLE: SERVICING MASTER PLANS
PRESSURE SEWER SCHEME
DETAILED SHEET 5 OF 5

ORIGINAL SIZE:	PLANIT JOB No.:	DRAWING No.:	REV:
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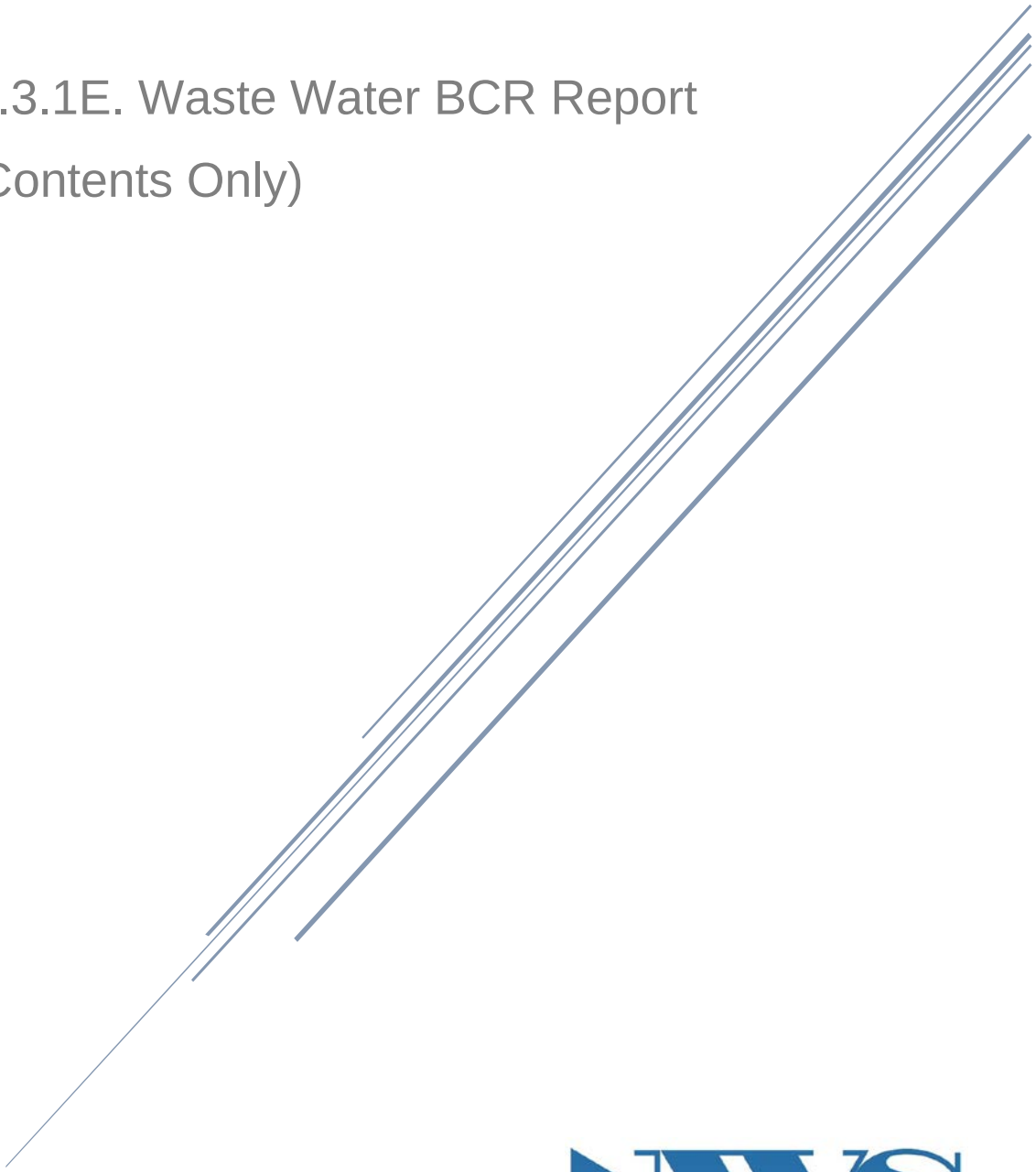
Appendix 4.3.1E. Waste Water BCR Report

(Table of Contents Only)



Cobaki Estate – Waste Water Discharge Boundary Conditions Report

Northern Water Solutions Pty Ltd

WGM Consulting

Date: September 2016

Document No.: J116 – RPT002 – Rev05

Document Status

Version	Document type	Reviewed by	Checked by	Date Issued
Rev 01	Report	A. Wells	B. Gohl	30/06/2016
Rev 02	Report	S.Robinson	A.Wells	15/07/2016
Rev 03	Report	W Williamson	A Wells	19/07/2016
Rev 04	Report	W Williamson	A Wells	1/09/2016
Rev 05	Report	W Williamson	A Wells	7/09/2016

Project Details

Project Name:	Cobaki Estate – Waste Water Discharge Boundary Conditions Report
Client	Northern Water Solutions Pty Ltd
CEO	Wayne Williamson
Authors	Andrew Wells
WGM Reference:	J116-RPT002

WGM Consulting
ABN 59 210 741 429
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
wgm@wgmconsulting.com.au

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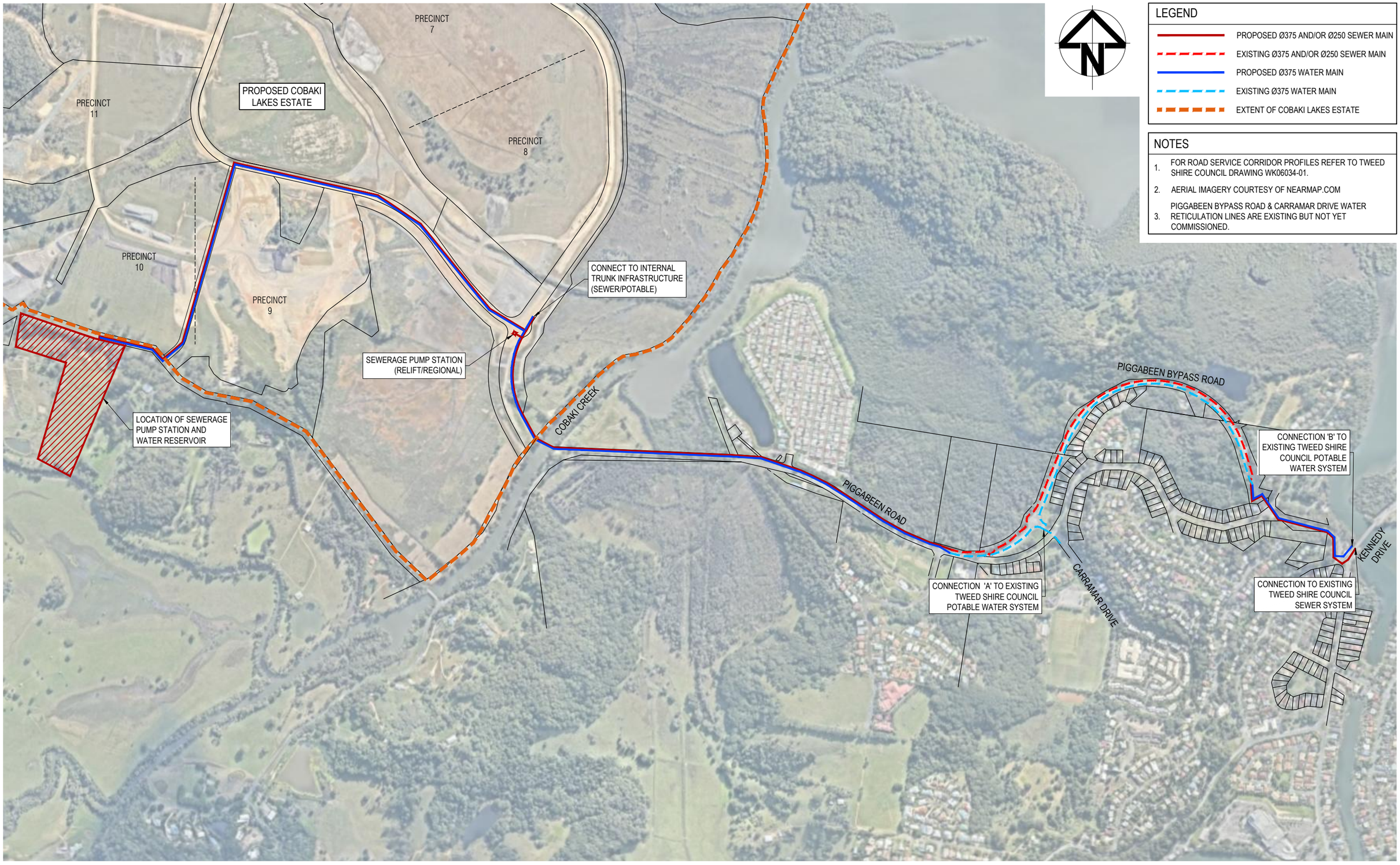
Appendix 4.3.3A. Plan of Source to Sewerage Connection Point



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- EXISTING Ø375 AND/OR Ø250 SEWER MAIN
- PROPOSED Ø375 WATER MAIN
- EXISTING Ø375 WATER MAIN
- EXTENT OF COBAKI LAKES ESTATE

NOTES

1. FOR ROAD SERVICE CORRIDOR PROFILES REFER TO TWEED SHIRE COUNCIL DRAWING WK06034-01.
2. AERIAL IMAGERY COURTESY OF NEARMAP.COM
3. PIGGABEEN BYPASS ROAD & CARRAMAR DRIVE WATER RETICULATION LINES ARE EXISTING BUT NOT YET COMMISSIONED.

Issue	Description	By	Ckd	RPEQ	Date
03	PUMP STATION AMENDMENT	BS	SP		
02	SERVICE CONNECTION POINTS AMENDED	NF	SP		22.07.16
01	ORIGINAL ISSUE	NF	SP		19.07.16

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Architect:

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Status: PRELIMINARY — NOT TO BE USED FOR CONSTRUCTION

Approved: R.P.E.Q No :

Scales: 1:5000 — Original Issue Signatures

Original Size: A1 — Drawn N.FAHEY; Designed S.POLLARD

Height Datum: AHD — Project Manager S.POLLARD

Grid: MGA (GDA94) —

Project: COBAKI LAKES ESTATE

Title: TWEED SHIRE COUNCIL TO NORTHERN WATER SOLUTIONS SERVICE CONNECTION SCHEMATIC WATER AND SEWER LAYOUT CONNECTION TO END (SOURCE)

ARCADIS
Arcadis Australia Pacific Pty Limited
P O Box, 1653
Southport QLD 4215
ABN 76 104 485 289
Tel No: +61 7 5532 3933
Fax No: +61 7 5591 4778
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Drawing No. SKC-00-001 — Project No. AA008836 — Issue 03

100mm on Original

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Appendix 4.3.9A. Preliminary Sewerage Risk Assessment

Project: Cobaki Estate
Client : Leda Manorstead
Title : Sewerage Preliminary Risk Assessment
Date (Revision): 16/09/2016
As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Scheme Component	Hazard	Hazardous Event	Impact	Unmitigated Risk					Control Strategy	Mitigated Risk				
				Likelihood		Consequence		Risk		Likelihood		Consequence		Risk
Wastewater generation	Excessive wastewater generation	Peak population or excessive water usage	Build-up of raw wastewater in the inlet balance tanks, PSUs. Potential overflow to the environment	C	Possible	2	Minor	Moderate	1. Water demand management strategy including minimum 3-star rated water efficient fixtures and appliances as required by BASIX. 2. Education, encouragement and empowerment of customers to move towards best practice water efficiency with 5-star fixtures and appliances and smart water metering. 3. Pressure sewerage collection system on all new lots to minimize infiltration of groundwater and storm water. 4. Continuous online monitoring of pump starts and run hours on each Pressure Sewer Unit (PSU) to allow abnormal flows to be detected by the SCADA control system. 5. Trade waste agreements and waste minimization plans will be required for non-residential customers. 6. All non-residential customers will have their own dedicated PSU to enable direct monitoring of trade waste discharges through the SCADA control system. 7. New customer contracts and access agreements that outline the responsibilities of the customer with regard to appropriate water usage and waste disposal practices. 8. Ongoing awareness and communication with existing customers through additional information provided at each billing cycle & the Cobaki website. 9. MBR has approximately 30-40% spare capacity during dry weather flows for treatment of peak flows. 10. Road tanker pump out from individual PSUs and inlet Redundancy tanks if required.	B	Unlikely	1	Insignificant	Low
	Trace contaminants in domestic wastewater	Poor household chemical use and disposal practices resulting in excessive contaminant levels in waste water	Potential environmental impacts on irrigation areas if not processed out by AWTP processes	C	Possible	2	Minor	Moderate	1. Customer supply contracts and recycled water use agreement will be developed with each customer and will include obligations and education regarding substances that should not to be disposed of too the sewerage network that should be avoided. 2. Ongoing customer awareness campaigns & information provided with each water bill & through the Cobaki Estate website. 3. Ability to install online water quality monitoring probes (e.g. TDS, pH, TOC etc.) into pressure sewer pump wells to detect suspected inappropriate trade waste practices.	B	Unlikely	2	Minor	Low
	Trace contaminants in commercial wastewater	Poor trade waste management practices resulting in excessive contaminant levels in recycled water	Potential environmental impacts on effluent irrigation areas	D	Likely	2	Minor	Moderate	1. Predominately residential sewerage catchment with non-residential customer's account for 10% of all wastewater generated. 2. Trade waste agreement will be developed with each non-residential customers to ensure wastewater is pre- treated to domestic standards before discharge into the sewerage system. 3. Each non-residential customer in the pressure sewer catchment will have its own low pressure sewage pump station to enable monitoring of customer specific compliance with trade waste agreements. 4. Ability to install online water quality monitoring probes (e.g. TDS, pH, TOC etc.) into pressure sewer pump wells to detect suspected inappropriate trade waste practices.	B	Unlikely	2	Minor	Low

	Shock load of chemical or other contaminants	Poor chemical or trade waste management practices resulting in shock load of contaminants on MBR	Potential biomass die off and reduction in MBR effluent quality Chemicals may also be an OHS hazard Impact on reuse potential	C	Possible	3	Moderate	High	1. Continuous online monitoring of MLSS, DO, pH, TDS and other process parameters to detect potential impacts on the treatment process. 2. If contaminants detected, an investigation will be undertaken into the source of contamination. This may involve review of Pressure Sewer Unit (PSU) operational data, water usage data, trade waste agreements etc. 3. Additional online water quality monitoring probes can be installed into suspect PSUs for tracing persistent sources of contamination if required. 4. Road tanker pump out of contaminated water from the WWTP inlet balance tank if required.	B	Unlikely	3	Moderate	Moderate
	Gross pollutants in raw wastewater	Poor solid waste management practices resulting in sewer blockage and overflow	Potential sewer blockage and overflow	E	Almost certain	2	Minor	Moderate	1. Low pressure sewerage system with grinder pumps will macerate sewage prior to entering the pipe network. 2. Appropriately designed gravity network designed to achieve self-cleansing velocities. 3. Sewer/pump blockage Emergency Response Plan will be developed for the scheme and will include steps for identification of route cause and preventative actions. Where multiple blockages have occurred at the same location, specific customer awareness/education will be implemented or compliance notices issued. 4. Flushing and maintenance regime will be developed for the pressure sewer network. 5. Cleaning and maintenance regime will be developed for the gravity sewer network. 6. Local contractors will be on call with equipment for clearing blockages. 7. Gravity catchment flows are macerated prior to entering the WWTP inlet Redundancy tank.	C	Possible	2	Minor	Moderate
Low Pressure Sewerage Collection System	Inflow and infiltration to the pressure sewer network	Inflow and infiltration into the pressure sewer network	Potential overflow from PSU or inlet Redundancy tank if combined inflows exceed capacity of MBR	D	Likely	2	Minor	Moderate	1. Low pressure sewerage system constructed with PE100, PN16 HDPE with welded joints and fittings. 2. Contractor induction and education. 3. ITPS inspections and quality assurance sign off during construction. 4. Flow and level monitoring at each PSU to detect sources of inflow. 5. PSU pump operation centrally controlled by the SCADA Control System. PSUs with high water level are given pumping priority. 6. WWTP Inlet Redundancy tanks (in concrete bund area) provides buffer during peak times and emergency storage. 7. More than 24 hours storage capacity in each PSU. 8. Road tanker pump out from individual pump units if required. 9. Bund emergency road tanker pump out from inlet Redundancy tanks.	C	Possible	2	Minor	Moderate
	Inflow and infiltration upstream of Pressure Sewer Unit (PSU)	Inflow and infiltration upstream of Pressure Sewer Unit (PSU)	Potential overflow from PSU	E	Almost certain	2	Minor	Moderate	1. Plumbing inspection of all household plumbing installation prior to connection of each lot gravity sub sewer. 2. Induction and awareness training for all domestic plumbing contractors working in the scheme. 3. Flow and level monitoring at each PSU to identify sources of inflow. Customer education and rectification notices will be provided if required. 4. Solvent welded joints in gravity sub sewers.	C	Possible	2	Minor	Moderate

	Blockages upstream of Pressure Sewer Unit (PSU)	Blockages upstream of Pressure Sewer Unit (PSU)	Potential overflow from PSU	E	Almost certain	2	Minor	Moderate	1. Plumbing inspection of all household plumbing installation prior to connection. 2. Induction and awareness training for all domestic plumbing contractors working in the scheme. 3. Upstream pipes designed and constructed to AS3500 plumbing code with 1:60 grade for self-cleaning. 4. Flow and level monitoring at each PSU to identify sources of blockages. Customer education and rectification notices will be provided if required. 5. Local contractors will be on call with cleaning equipment for removing blockages.	C	Possible	2	Minor	Moderate
	High peak diurnal flows	Excessive peak inflows	Potential overflow from PSU or inlet balance tank if combined inflows exceed capacity of MBR	C	Possible	2	Minor	Moderate	1. Inlet Redundancy tanks at the WWTP provides buffer storage for diurnal flows. 2. Storage capacity in each PSU provides buffer storage for diurnal flows. 3. PSU pump operation centrally controlled by the SCADA Control System. PSUs with high water level are given pumping priority in the control system. 4. Emergency road tanker pump out from inlet balance tank if required.	A	Rare	2	Minor	Low
	Pressure sewer main break	Pressure main failure or breakage due to unapproved excavation activity	Discharge of raw sewage to the environment	C	Possible	3	Moderate	High	1. All mains constructed with PE100, PN16 HDPE pipe with welded joints and fittings. 2. All mains are pressure tested and certified during construction. 3. Pressure sewer mains are generally located at the bottom of a common services trench, hence other pipes will be damaged from poor excavation practices before the pressure sewer. 4. Signage and identification tape to be installed above all pressure mains. 5. All sewer pipe locations registered with dial before you dig service. 6. Flow monitoring at the WWTP will identify major variations in daily flow. 7. Customer Service Centre and fault reporting with maximum response times for operations staff. 8. Sewer spill Emergency Response Plan and clean-up procedures will be developed. 9. Pressure and flow monitoring in the pressure sewer network.	B	Unlikely	2	Minor	Low
	Leakage from PSU wet well	Failure of PSU wet well resulting in subsurface leakage	Discharge of raw sewage to groundwater	C	Possible	2	Minor	Moderate	1. Clean water static pressure test of each wet well during construction. 2. Wet well designed to include allowances for all structural loads including hydrostatic and soil pressures. 3. Timber bollards or fencing around all PSUs to prevent vehicle access in trafficked areas. 4. Water level and flow monitoring at each PSU.	B	Unlikely	2	Minor	Low
	Pump Failure	Pump failure by power surge, blockage, loss of suction etc.	Potential discharge of raw sewage to the environment	D	Likely	3	Moderate	High	1. All pumps in the scheme are monitored by the SCADA control system and an alarm raised if any abnormality is detected. Monitoring includes: wet well water level, pump fault detection, power system fault detection, number of starts and run hours for both the duty and standby pumps, current draw in operation and during start up and energy consumption. 2. Duty and standby pumps in each PSU in the Cobaki Estate pressure sewerage catchment. 3. Fail safe in electrical system so pump can operate during control system failure. 4. High quality robust pumps with long design life.	B	Unlikely	3	Moderate	Moderate

Project: Cobaki Estate
Client : Leda Manorstead
Title : Sewerage Preliminary Risk Assessment
Date (Revision): 16/09/2016
As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Low Pressure Sewerage Collection System	Power failure	Extended power failure across pressure sewer network	Potential discharge of raw sewage to the environment	E	Almost certain	3	Moderate	High	1. 24 hours emergency storage is provided in all PSUs. 2. Low pressure sewer network start up and recovery process is included in Direct Digital Control System logic to avoid excessive simultaneous pump operation. 3. Road tanker pump out from individual PSUs if required. 4. Inlet Redundancy tanks provides storage for peak inflows should a control system failure and power failure occur simultaneously.	B	Unlikely	2	Minor	Low
	Blockages upstream of SPS	Blockages upstream of SPS	Potential overflow from SPS or inlet balance tank if combined inflows exceed capacity of MBR	E	Almost certain	2	Minor	Moderate	1. Upstream pipes designed and constructed to WSAA code to achieve self-cleaning. 2. Local contractors on call with cleaning equipment for removing blockages. 3. Maintenance access designed into the sewerage network. 4. Customer Service Centre and fault reporting with maximum response times for operations staff. 5. Sewer spill Emergency Response Plan and clean-up procedures will be developed. 6. Operation and maintenance plan for gravity main cleaning.	C	Possible	2	Minor	Moderate
	High peak diurnal flows	Excessive peak inflows	Potential overflow from inlet Redundancy tank if combined inflows exceed capacity of MBR	C	Possible	2	Minor	Moderate	1. Inlet Redundancy tanks at the WWTP provides buffer storage for diurnal flows. 2. Storage capacity in PSU tanks, upstream reticulation network and below ground storage provides buffer storage for diurnal flows. 3. PSU pump operation is centrally controlled by the SCADA Control System. 4. Emergency bund truck pump out from Redundancy tanks if required. 5. Approximately 40% spare capacity in the MBR during dry weather flows for treatment of peak flows.	A	Rare	2	Minor	Low
	Gravity sub sewer break	Gravity sewer failure or breakage due to unapproved excavation activity	Discharge of raw sewage to the environment	C	Possible	3	Moderate	High	1. Signage and identification tape to be installed above all gravity mains. 2. All sewer pipe locations registered with dial before you dig service. 3. Flow monitoring at the WWTP will identify major variations in daily flow. 4. Customer Service Centre and fault reporting with maximum response times for operations staff. 5. Sewer spill Emergency Response Plan and clean-up procedures will be developed.	B	Unlikely	2	Minor	Low
Wastewater Treatment - Redundancy Balance Tank, Membrane Bioreactor + UV Disinfection	Power failure	Extended power failure at PSUs	Potential discharge of raw sewage to the environment	E	Almost certain	3	Moderate	High	1. WWTP Redundancy balance tank provides storage for peak inflows that could occur if a control system failure and power failure occur simultaneously. 2. Emergency bund road tanker pump out from Redundancy balance tank if required. 3. Standby power generator is provided at the WWTP.	B	Unlikely	2	Minor	Low

	Failure of WWTP Redundancy balance tank	Tank failure	Discharge of process water to environment	C	Possible	4	Major	Very high	1. 316 stainless steel panel tank construction to minimize corrosion potential. 2. Inlet structure to enable the rising mains to discharge into the bottom of the Redundancy tank below the bottom water level to minimize release of gases which could cause corrosion inside the tank. 3. If odor and/or corrosion issues are observed in operation, the incoming rising mains will be injected with metal salts to minimize the release of hydrogen sulphide and formation of acid inside the tank. 4. Benched tank floor and mechanical jet mixers inside the tank to minimize sedimentation of solids inside the tank and minimize volume at bottom water level. 5. Sealed tank with ventilation of gases through a McBerns activated carbon filters with extraction fan. 6. Well washer system to enable automatic cleaning of the tank following a high level event. 7. Tank is to be located in a concrete lined and bund area. Bund storage volume equivalent to >100% of the tank volume. 8. Concrete bund truck loading area, with quick coupling valves and start/stop controls for filling road tankers. 9. Designed to minimize/avoid human access.					
	Structural failures of process tanks and pipes	Tank failure	Discharge of process water to environment	C	Possible	3	Moderate	High	1. Stainless steel tanks with appropriately designed footings. 2. Quality assurance during tank manufacture and installation.	A	Rare	3	Moderate	Low
	Process tank overflows	Blockage or fault causing overflow of process tanks	Discharge of process water to environment	C	Possible	2	Minor	Moderate	1. All process tanks gravity overflow back to MBR inlet tanks. 2. Screening system on inlet to MBR tank is to remove gross solids and avoid blockages.	B	Unlikely	2	Minor	Low
	Mechanical/ electrical items	Failure of mechanical electrical items	Non-compliant recycled water	E	Almost certain	3	Moderate	High	1. Fault detection on all critical mechanical electrical components. 2. Continuous online water quality monitoring of critical process parameters, e.g. DO, pH, MLSS, transmembrane pressure, turbidity, UV intensity.	C	Possible	2	Minor	Moderate
	Power blackouts	Extended power blackout	Loss of treatment capacity	E	Almost certain	3	Moderate	High	1. No sewage inflow to MBR during power blackout as pressure sewer system will also be down 2. Wastewater will Build-up in 24 hours emergency storage at each PSU. 3. Road tanker pump out from each PSU if required. 4. Electrical connection point for mobile power generator to power MBR if required. 5. Battery backup of SCADA control systems.	C	Possible	2	Minor	Moderate
	Blockage of inlet screening unit	Blockage of screening unit caused by excessive solids in raw wastewater	Carryover of solids to MBR with reduced treatment performance and increased risk of membrane failure	C	Possible	2	Minor	Moderate	1. Only macerated sewage will enter the plant. 2. Water level monitoring and high level alarm in screening unit. 3. If screening blockage occurs undertake investigation into source of gross solids and implement preventative actions.	B	Unlikely	2	Minor	Low

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As per Tables 2.5, 2.6 & 2.7: Australian Guidelines for Water Recycling: Managing Health and Environmental Risks-phase 1 (2006)

Wastewater Treatment - Inlet Balance Tank, Membrane Bioreactor + UV Disinfection	Hydraulic overload during diurnal peak flows	Excessive sewerage flows	Build-up of raw wastewater in the inlet balance tank and PSUs. Potential overflow to the environment	C	Possible	2	Minor	Moderate	1. WWTP Inlet Redundancy tanks have a minimum of 660 kL storage capacity providing buffer storage for diurnal flows. 2. Integrated into the design of each MBR train is 80 kL of buffer storage provided in the inlet tank, anaerobic tank and anoxic tank. 3. MBR has approximately 30-40% spare capacity during dry weather flows for treatment of peak flows. 4. 24 hour storage capacity in each PSU can also provide buffer storage in extreme events. 5. Total available emergency storage in the scheme exceeds 36 hours storage at ADWF. 6. PSU pump operation centrally controlled by the SCADA Control System. PSUs with high water level are given pumping priority through the control system logic. 7. Road tanker pump out from individual PSUs if required during operation. 8. Emergency road tanker pump out if required from WWTP Inlet Redundancy tanks in a concrete bund area.	B	Unlikely	2	Minor	Low
	Hydraulic overload during wet weather events	Excessive sewerage flows caused by extreme rain events	Build-up of raw wastewater in the inlet balance tank and PSUs. Potential overflow to the environment	C	Possible	3	Moderate	High	1. Total available emergency storage in the system exceeds 36 hours storage at ADWF (see control strategies on previous point). 2. MBR has approximately 30-40% spare capacity during dry weather flows for treatment of peak flows. 3. During wet weather the following level monitoring and actions will be undertaken. (Note: These level set points will be adjustable in operation) 4. As a further safeguard the WWTP inlet Redundancy tanks is located in a concrete bund area with a minimum storage capacity of 660 kL that will be utilized in the unlikely event that the WWTP inlet Redundancy tanks overflow.	B	Unlikely	2	Minor	Low
	Pollutant overload	Excessive BOD or ammonia load	Non-compliant recycled water	C	Possible	3	Moderate	High	1. Continuous online monitoring of MBR process DO, MLSS, pH with alarms. 2. Variable speed drive aeration system to match air supply with inflow and DO set point. Reserve capacity is designed into the aeration system. 3. If process impacts due to high pollutant loads are observed a source control investigation will be undertaken using raw wastewater, trade waste data and pressure sewer pump data.	B	Unlikely	3	Moderate	Moderate
	Membrane CIP waste	Return of chemical laden CIP waste through MBR	Potential upset of treatment process and biomass die off	D	Likely	3	Moderate	High	1. The MBR CIP waste will be trucked off site to nearest approved facility.	B	Unlikely	3	Moderate	Moderate
	Process chemicals	Spillage of process chemicals	Potential release of chemicals to the environment Potential OH&S impacts	C	Possible	3	Moderate	High	1. Appropriate bund and separation of chemicals in chemical storage and delivery area. 2. Standard operating procedures for the transport, receipt and use of chemicals.	A	Rare	2	Minor	Low
	Waste activated sludge	Inadequate sludge wastage rates	High MLSS in MBR, decline in effluent quality & increased membrane fouling	E	Almost certain	3	Moderate	High	1. Continuous online monitoring of MLSS, DO and TMP with alarms. 2. When MLSS reaches maximum set point sludge is pumped from the bottom of the MBR tank to a sludge holding tank before offsite disposal to approved facility.	B	Unlikely	3	Moderate	Moderate

	Membrane failure	Membrane failure resulting in carryover of human pathogens	Non-compliant permeate feed water	D	Likely	4	Major	Very high	1. Continuous online monitoring of membrane permeate turbidity and transmembrane pressure. 2. If event occurs, identify and isolate failed membrane module and if required replace failed membrane module. 3. Shut off irrigation supply pump and undertake monitoring of pond water quality to ensure compliance. 4. An Emergency Response Plan will be developed for MBR membrane failure.	B	Unlikely	4	Major	High
Wastewater Treatment - Inlet Redundancy Tank, Membrane Bioreactor + UV Disinfection	UV failure	Inadequate UV dose due to lamp failure, reactor fouling, high flow or high turbidity	Non-compliant permeate feed water	E	Almost certain	3	Moderate	High	1. Continuous online monitoring UV intensity, flow, upstream permeate turbidity and lamp failure. 2. If Low UV dose is recorded investigate and rectify. 3. An Emergency Response Plan will be developed for UV lamp failure. 4. Auto cleaning UV unit.	C	Possible	3	Moderate	High
	Sabotage/ vandalism	Sabotage/vandalism	Potential loss of treatment function	C	Possible	4	Major	Very high	1. Lockable site with 2.4m secure fencing. 2. Lockable shed for all treatment equipment. 3. Remotely accessible CCTV system at WWTP site. 4. Community awareness and involvement in the local water scheme.	B	Unlikely	3	Moderate	Moderate
	Noise	Excessive noise generation	Noise complaints for nearby residents	C	Possible	2	Minor	Moderate	1. A 80 meter buffer from the WWTP to the nearest residential dwelling. 2. WWTP building located adjacent rural lands. 3. The MBR and AWTP are located inside the WWTP building. 4. Specific “noisy” equipment items like aeration blowers etc will be housed inside custom noise enclosures. 5. Equipment specifications and design of custom noise enclosures will be undertaken to ensure compliance with the NSW Industrial Noise Policy of background noise plus 5 dBA at nearest residential dwelling. 6. All planned construction and routine maintenance works will be undertaken during standard permissible hours. 7. All emergency works will be undertaken to minimize noise impacts on residents. 8. Wilton Water has a 24 hour customer service call center for fielding all noise and other complaints. All complaints are recorded, reviewed and acted upon as outlined in Onsite WWMP.	A	Rare	2	Minor	Low

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	Odor	Excessive odor generation	Odor complaints by nearby residents	C	Possible	2	Minor	Moderate	1. Ventilation stacks provided on all house connections to ensure gravity sewers are well ventilated. 2. All gravity sewers designed to achieve self-cleansing velocity to avoid accumulation and breakdown of solids in the network. 3. Minimum of 80 m buffer between the WWTP site and residential dwellings. 4. Passively ventilated McBerns activated carbon filters will be used on all air valves in the pressure sewer network 5. Inlet structure to enable the rising mains to discharge into the bottom of the WWTP inlet Redundancy tanks below the bottom water level to minimize release of gases inside the tank. 6. Actively ventilated McBerns activated carbon filter on the WWTP inlet Redundancy tanks. 7. All other treatment tanks are located inside the WWTP building. 8. All treatment tanks are sealed with passive ventilation through McBerns activated carbon filters located on the roof of the WWTP building. 9. The MBR room in the WWTP building has automatic indoor air quality monitoring for temperature, oxygen, hydrogen sulphide and methane, with automatic operation of an evaporative air conditioning unit to maintain ventilation and air quality. 10. WWTP building includes deodorizing sprayers for use if required. 11. The Cobaki Estate has a 24 hour customer service call center for fielding all odor and other complaints. All complaints are recorded, reviewed and acted upon as outlined in the Onsite WWMP.	A	Rare	2	Minor	Low
Wastewater Treatment - Inlet Balance Tank, Membrane Bioreactor + UV Disinfection	Aesthetics	Excessive visual impacts	Complaints from nearby residents	C	Possible	2	Minor	Moderate	1. All pressure sewer units (PSU) are located below ground. The only visible infrastructure is the lid and power turret for each PSU. 2. There will be approximately 4 lots connected to each PSU, which results in a lower visual impact compared to a standard pressure sewer model where there is one PSU for every lot. 3. Minimum of 80m buffer between the WWTP site and residential dwellings. 4. All MBR and AWTP assets are located inside the WWTP building. 5. The WWTP building is located in a rural zoned area with buildings of similar construction and visual appearance. 6. The scheme uses onsite recycled water storage with variable speed drive booster pump sets, hence there is no need to construct an elevated reservoir on a hill near the site to provide service pressures to the scheme.	A	Rare	2	Minor	Low
	Indoor air quality inside MBR building modules	Contamination of indoor air with harmful sewer gases	OH&S impacts	B	Unlikely	4	Major	High	1. All treatment tanks are sealed and externally ventilated. 2. Continuous online monitoring of indoor air quality for oxygen, hydrogen sulphide and methane gas inside the WWTP building, with automated air conditioner/ventilation system operation and alarm systems.	B	Unlikely	3	Moderate	Moderate

SEWERAGE QUALITATIVE ENVIRONMENTAL AND PUBLIC HEALTH RISK ASSESSMENT CRITERIA

From Tables 2.5, 2.6 and 2.7 on Page 39 of the Australian Guidelines for Water Recycling Managing Health & Environmental Risks Phase 1 (2006)

Qualitative Measures of Likelihood

Level	Descriptor	Example Description from AGWR
A	Rare	May occur only in exceptional circumstances. May occur once in 100 years
B	Unlikely	Could occur within 20 years or in unusual circumstances
C	Possible	Might occur or should be expected to occur within a 5- to 10- year period
D	Likely	Will probably occur within a 1- to 5- year period
E	Almost certain	Is expected to occur with a probability of multiple occurrences within a year

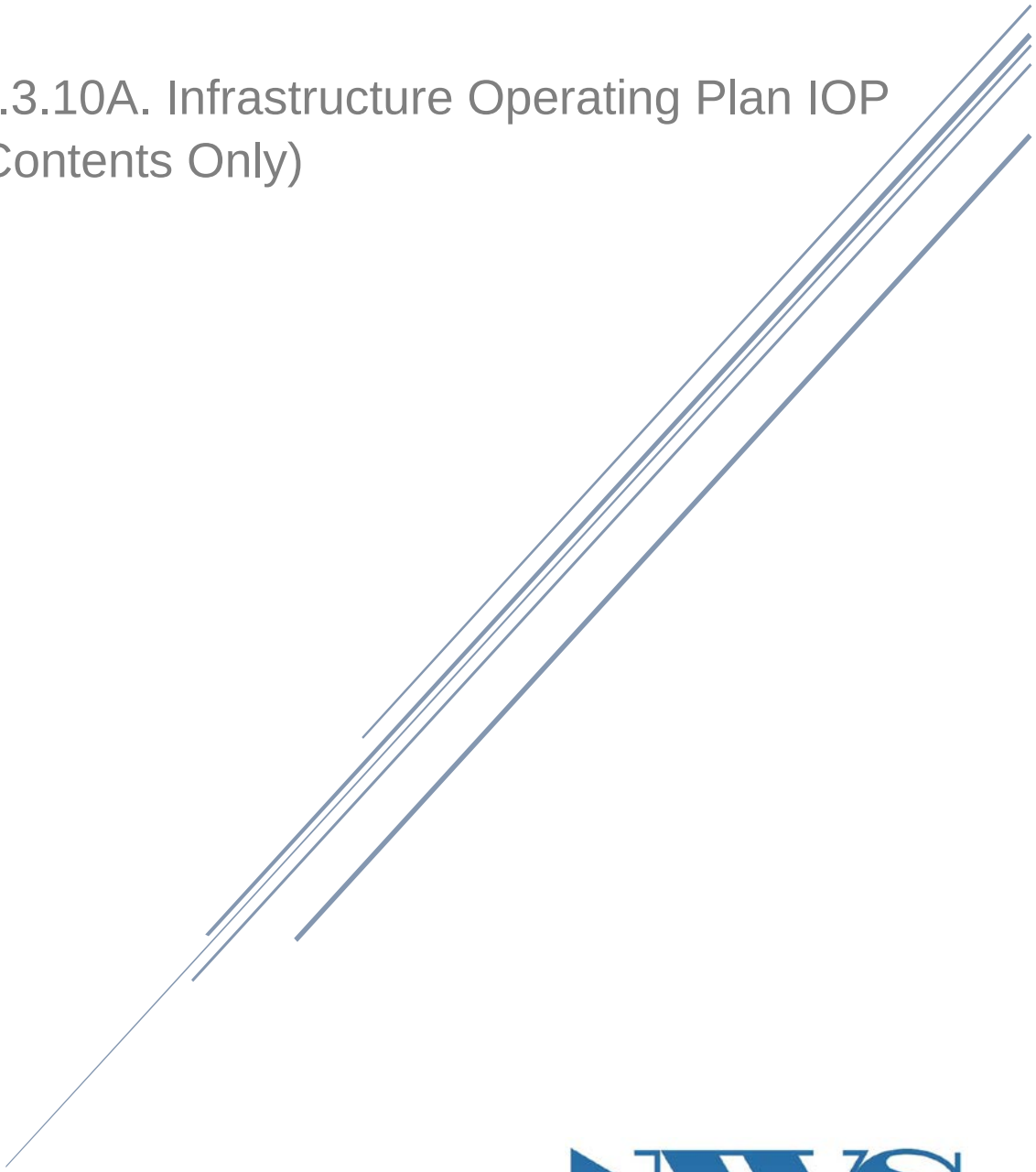
Qualitative Measures of Consequence or Impact

Level	Descriptor	Example Description from AGWR
1	Rare	Insignificant impact or not detectable
2	Minor	Health — Minor impact for small population
3	Moderate	Health — Minor impact for large population
4	Major	Health — Major impact for small population
5	Catastrophic	Health — Major impact for large population Environment — Potentially lethal to regional ecosystem or threatened species; widespread on- site and off- site impacts

Qualitative Risk Analysis Matrix: Level of Risk

Likelihood		Consequences				
		1	2	3	4	5
		Insignificant	Minor	Moderate	Major	Catastrophic
A	Rare	Low	Low	Low	High	High
B	Unlikely	Low	Low	Moderate	High	Very high
C	Possible	Low	Moderate	High	Very high	Very high
D	Likely	Low	Moderate	High	Very high	Very high
E	Almost	Low	Moderate	High	Very high	Very high

Appendix 4.3.10A. Infrastructure Operating Plan IOP (Table of Contents Only)



Cobaki Estate Development Tweed Heads, NSW

Infrastructure Operating Plan

September 2016

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Appendix 4.3.10B MBR O&M Manual

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Cobaki Estate Tweed Heads NSW

MBR Operations and Maintenance Manual

October 2016

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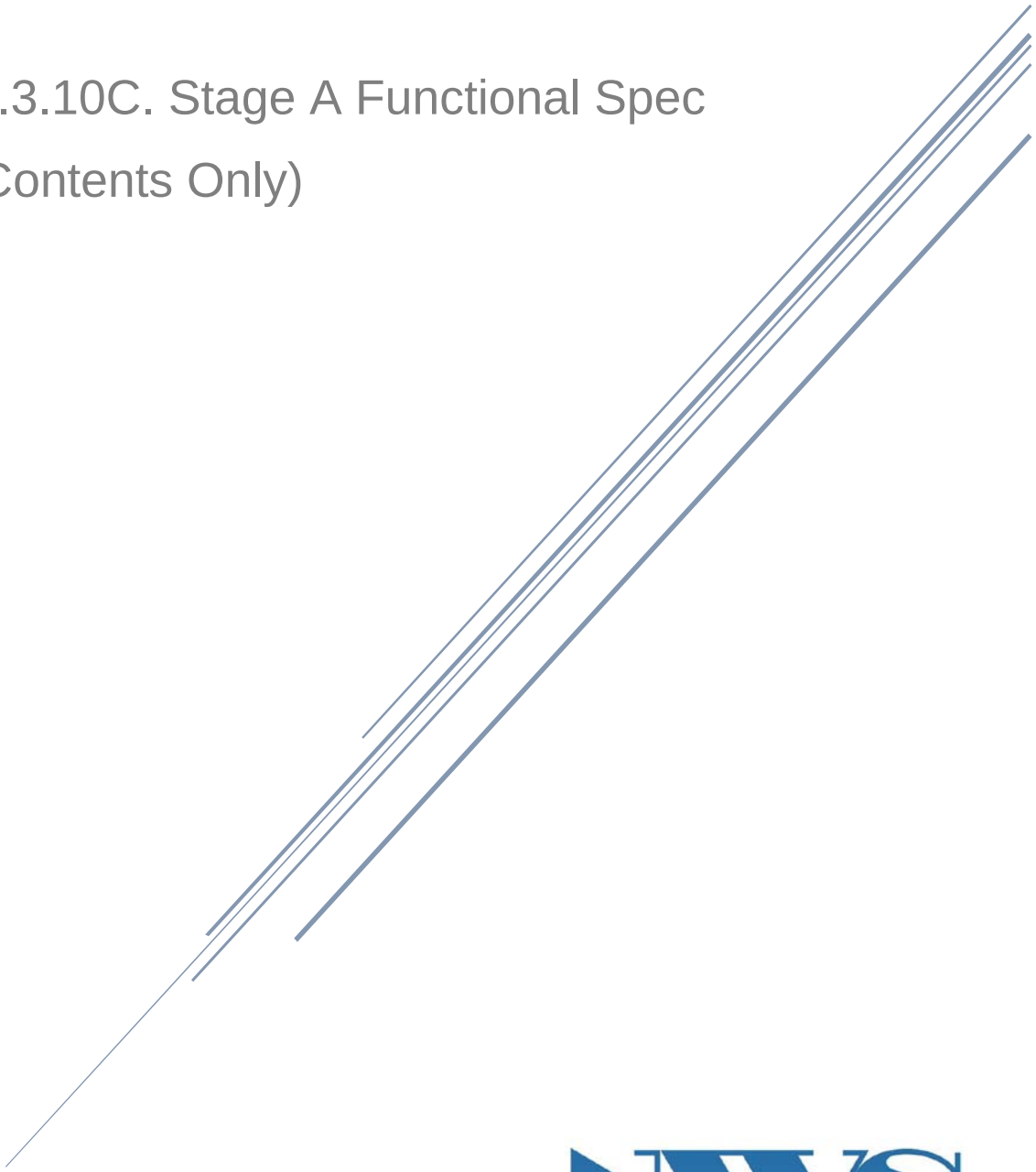
Appendix 4.3.10C. Stage A Functional Spec (Table of Contents Only)



Cobaki Estate Development Piggabeen Road, Tweed Heads NSW

Water and Waste Water Plants Functional Specification

Stages A, B, C and D

October 2016

Revision 4

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Appendix 4.3.10E. WWTP HAZID and Risk Assessment (Table of Contents Only)

Cobaki Estate – Waste Water Treatment Plant Hazards Analyses and Risk Assessment

Northern Water Solutions Pty Ltd

WGM Consulting

Date: 21 October 2016

Document No.: J116 – RPT008 – Rev 00

Document Status

Version	Document type	Reviewed by	Checked by	Date Issued
Rev 00	Report	J. Hart	A.Wells	21/10/16

Project Details

Project Name:	Cobaki Estate – Waste Water Treatment Hazards Analyses and Risk Assessment Report
Client	Northern Water Solutions Pty Ltd
Client Project Manager	Wayne Williamson
Authors	John Hart
WGM Reference:	J116

WGM Consulting
ABN 59 210 741 429
Suite 9a, 80-84 Ballina Street
Lennox Head NSW 2478
(PO Box 161, Lennox Head NSW 2478)
Telephone – 02 6687 4666
wgm@wgmconsulting.com.au

This report has been produced by Planit Engineering Pty Ltd, formerly WGM Consulting, all findings and assessments provided within this report have been made by Planit Engineering.

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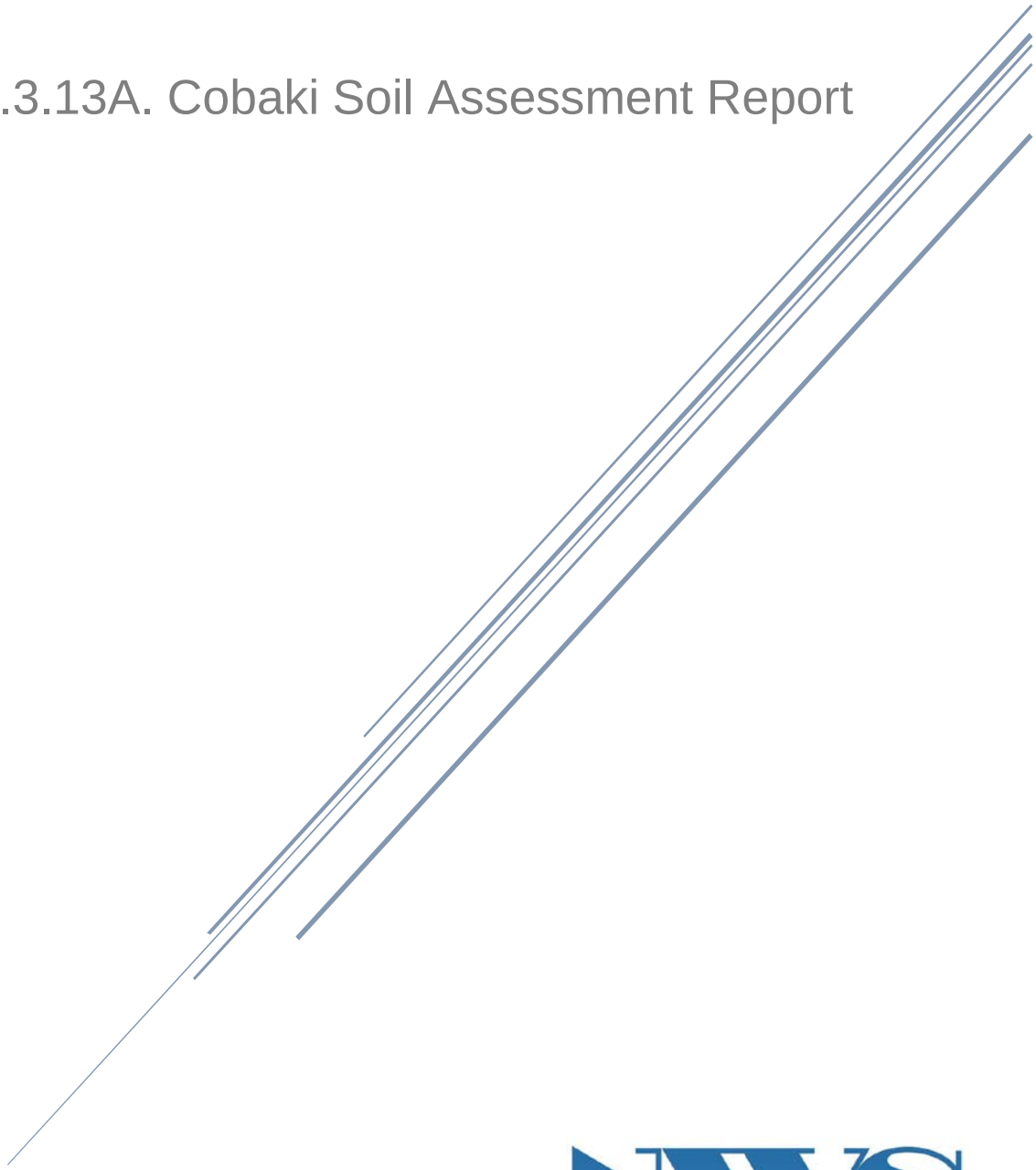
Appendix 4.3.13A. Cobaki Soil Assessment Report



Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
Unit 4, 482 Scottsdale Drive
Varsity Lakes QLD 4227
Phone (07) 5568 8900
Fax (07) 5568 8999

Leda Developments
Suite 14, Level 1
46 Cavill Avenue
SURFERS PARADISE QLD 4217
Attention: Brandon Yeats

Email: Brandon.yeats@ledaholdings.com.au

Project 82508.11
16 June 2016
L.001 Cobaki Lakes.docx
GS:sj

Dear Sirs

Permeability Assessment (Factual Report)
Central Open Space
Proposed Residential Subdivision, Cobaki Lakes Estate, Cobaki Lakes

1. Introduction

As requested by Leda Developments Pty Ltd, Douglas Partners Pty Ltd (DP) has conducted a site investigation to assess the insitu permeability of the existing subsurface strata at the Central Open Space area, Cobaki Lakes Estate, Cobaki Lakes.

The report must be read in conjunction with the attached notes *'About this Report'*.

The testing comprised twelve constant head permeability tests at select locations. The constant head permeability testing was carried out in accordance with AS/NZS 1547:2007.

The subsurface strata encountered during the field work comprised a mix of clay, silt and crushed rock filling.

A summary of the constant head permeability test results, at each test location, are shown below in Table 1 with the approximate test locations shown on the attached schematic test location plans.

Table 1: Summary of Constant Head Permeability Test Results

Test Location	Permeability Ksat (m/dry)
1	0.018
2	0.049
3	0.011
4	0.122
5	0.020
6	0.026
7	0.038
8	0.064
9	0.011
10	0.108
11	0.105
12	0.066

Note: The above results are based on test locations only, and variations in permeability, within the filling, may occur between these test locations.

Limitations

The works for this project were carried out under DP's '*Conditions of Engagement'*. This report is provided for the exclusive use of Leda Developments Pty Ltd, or their consulting engineers, for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction of all works (not just geotechnical components) and the controls required to mitigate risk. DP should be contacted to provide specific advice with respect to a Safety Report where it is to be prepared.

Please contact the undersigned if you have any questions on this matter.

Yours faithfully
Douglas Partners Pty Ltd

Gary Samuels
Associate

Attachments: About this Report
Schematic Test Location Plans

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.


CASUAL PARK
AREA: 2.07HA
STRUCTURED OPEN SPACE
AREA: 6.76HA
3 SOCCER | RUGBY | LEAGUE
1 AFL | CRICKET
FACILITIES | CLUB HOUSE
OPT1
OPT2
OPT3
OPT4
OPT5
PT6
COBAKI TOWN
CENTRE
PRECINCT 5
AND PART
PRECINCT 6
FAUNA
CORRIDOR
30M WIDE
BUSHFIRE
APZ
SCHOOL
3.23ha
(EXCLUDING 5M
WIDE GREENLINK)
STAGE 3


SCHOOL
3.23ha
(EXCLUDING 5M
WIDE GREENLINK)
STRUCTURED OPEN SPACE
AREA: 14.65HA
6 SOCCER | RUGBY | LEAGUE
3 AFL | CRICKET
FACILITIES | CLUB HOUSE
PARK
PT7
PT8
PT9
PT10
PT11
PT12
POS 6
1137SQM
LEDA
NORTH