Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works approval number	W6451/2020/1
Works approval holder	Water Corporation
Registered business address	629 Newcastle Street LEEDERVILLE WA 6007
DWER file number	DER2020/000327
Duration	23/04/2021 to 22/04/2026
Date of issue	23/04/2021
Premises details	Broome North Wastewater Treatment Plant Crab Creek Road BROOME WA 6725 Lot 1502 on Plan 75036 Certificate of Title Volume 2805 Folio 367 As defined by the coordinates in Schedule 1

Prescribed premises category description **(Schedule 1, *Environmental Protection Regulations 1987*)**	**Assessed production or design capacity**
Category 54 Sewage facility: premises – (a) On which sewage is treated (excluding septic tanks); or (b) From which treated sewage is discharged onto land or into waters.	4,770 cubic meters per day
Category 61 Liquid waste facility: premises on which liquid waste produced on other premises (other than sewage waste) is stored, reprocessed, treated or irrigated.	2,400 tonnes per annual period

This works approval is granted to the works approval holder, subject to the attached conditions, on 23 April 2021, by:

Jarrod Abrahams 2021.04.23 12:01:01 +08'00'

MANAGER WASTE INDUSTRIES
REGULATORY SERVICES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Interpretation

In this works approval:

(a) the words ‘including’, ‘includes’ and ‘include’ in conditions mean “including but not limited to”, and similar, as appropriate;

(b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;

(c) where tables are used in a condition, each row in a table constitutes a separate condition;

(d) any reference to an Australian or other standard, guideline, or code of practice in this works approval:

  (i) if dated, refers to that particular version; and

  (ii) if not dated, refers to the latest version and therefore may be subject to change over time;

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act; and

(f) unless specified otherwise, all definitions are in accordance with the EP Act.

NOTE: This works approval requires specific conditions to be met but does not provide any implied authorisation for other emissions, discharges, or activities not specified in this works approval.

This works approval does not provide any implied authorisation for the clearing of native vegetation in order to meet the conditions or activities specified in this works approval. The clearing of native vegetation requires a separate Native Vegetation Clearing Permit issued under the EP Act.

Works approval conditions

The works approval holder must ensure that the following conditions are complied with:

Construction phase

Infrastructure and equipment

1. The works approval holder must;

(a) construct and install the infrastructure and equipment;

(b) in accordance with the corresponding design and construction / installation requirements; and

(c) at the corresponding infrastructure location,

as set out in Table 1.

Table 1: Design and construction / installation requirements

	Works Stage	Infrastructure and equipment	Design and construction / installation requirements	Infrastructure location
1.	Stage 1	Pond 2	(a) Pond 2 must be isolated, drained and de-sludged prior to the commencement of works above the pond liner. Removed sludge must be directed to a lined, temporary sludge drying area which directs all leachate to Pond 1; (b) An anaerobic zone must be installed within the western section of Pond 2. The anaerobic zone must; (i) have a final floor level of 11.6 m AHD; (ii) be connected to inflow pipework so that sewage inflow to Pond 2 is received in the anaerobic zone; (iii) be concrete lined at the base to achieve a final permeability no more than 2 x 10^{-10} m/s; (iv) have a sidewall slope no greater than 1:3 (V:H); (v) be lined on the side-walls with a Geosynthetic Clay Liner (GCL), installed in accordance with the item requirements in Schedule 3; and (vi) have a sand and rip-rap protective layer overlying the GCL. (c) A berm must be constructed to create a secondary facultative zone and maturation zone within Pond 2. The berm must; (i) be lined with a BGM liner, installed in accordance with the manufacturers specifications and have a final permeability no more than 1 x 10^{-9} m/s**;** (ii) contain an outlet connecting the secondary facultative and maturation zones; and (iii) retain a 0.5 metre freeboard across the whole of Pond 2;	Figure 2

	Works Stage	Infrastructure and equipment	Design and construction / installation requirements	Infrastructure location
	Stage 1 (cont.)		(d) A baffle must be installed within the maturation zone, positioned to maximise the retention time of wastewater within the maturation zone; (e) A sludge withdrawal system must be installed and connected to the anaerobic zone. The system must be capable of conveying sludge to the existing sludge drying beds; (f) The existing liner must be inspected for damage at the completion of the works. Any damage identified through the inspection must be repaired; (g) A concrete lined spillway must be installed connecting the maturation zone of Pond 2 with the Storage dam; and (h) Existing pipelines must be reconfigured to accommodate the new and modified infrastructure.	
2.	Stage 2	Inlet screening area	(a) Must contain 3 x 100 L/s rotary inclined screens; (b) Pipework to and from the new inlet screens must be re-laid; (c) Must be situated above a concrete hardstand constructed free of leaks and defects and lined to achieve a permeability of less than 1 x 10^{-9} m/s; and (d) The hardstand area must be designed and installed to return leaks, spills and runoff to the treatment pond system.	Figure 2
3.		Pond 1	(a) Pond 1 must be isolated, drained and de-sludged prior to the commencement of works above the pond liner. Removed sludge must be directed to a lined, temporary sludge drying area which directs all leachate to Pond 2; (b) A berm must be constructed to create a secondary facultative zone and maturation zone within Pond 1. The berm must: (i) be lined with a Bitumenous Geomembrane (BGM) liner, installed in accordance with the manufacturers specifications and have a final permeability no more than 1 x 10^{-9} m/s; (ii) contain an outlet connecting the secondary facultative and maturation zones; and (iii) retain a 0.5 metre freeboard across the whole of Pond 1. (c) A baffle must be installed within the maturation zone, positioned to maximise the retention time of wastewater within the maturation zone; (d) A sludge withdrawal system must be installed and connected to the existing anaerobic zone. The system must be capable of conveying sludge to the existing Sludge drying beds;	Figure 2

	Works Stage	Infrastructure and equipment	Design and construction / installation requirements	Infrastructure location
	Stage 2 (cont.)		(e) The existing liner must be inspected for damage at the completion of the works. Any damage identified through the inspection must be repaired; (f) A concrete lined spillway must be installed connecting the facultative zones of Ponds 1 and 2; and (g) Existing pipelines must be reconfigured to accommodate the new and modified infrastructure.	
4.	Stage 3	2 x Treated wastewater disinfection tanks	(a) Must have an individual capacity of 60 kL; (b) Must be provided with an overflow pipeline capable of returning potential overflows to the treatment ponds; and (c) Must be installed free of leaks and defects.	Figure 2
5.		Irrigation Pivot 3	(a) Must be installed to cover an irrigation area no less than 23.75 ha; and (b) Associated pipework, fittings and pumps must be hydraulically tested to the required pressure and deemed fit for purpose prior to use.	Figure 3

2. The works approval holder must not depart from the design and construction / installation requirements specified in Table 1 except where;

(a) such a departure does not increase risks to public health, public amenity or the environment; and

(b) all other conditions in this works approval are still satisfied.

Critical Containment Infrastructure

3. The works approval holder may only contain waste within Pond 2 where;

(a) the Critical Containment Infrastructure Report required by condition 4 has been submitted to the CEO; and

(b) the CEO has notified the works approval holder that the Critical Containment Infrastructure Report as required by condition 4 meets the requirements of that condition;

or

(c) at least 15 business days have passed after the Critical Containment Infrastructure Report for that item of infrastructure as required by condition 4 has been submitted to the CEO.

4. The works approval holder must within 30 calendar days of the Pond 2 anaerobic zone required by Table 1: Row 1(b) being constructed;

(a) undertake an audit of their compliance with the corresponding design and construction / installation requirements of condition 1; and

(b) prepare and submit to the CEO a Critical Containment Infrastructure Report on that compliance.

5. The Critical Containment Infrastructure Report required by condition 4, must be;

(a) written and certified by a suitably qualified person who has performed construction quality assurance (CQA) testing on the anaerobic zone GCL installation;

(b) contains the quality control information supplied by the GCL manufacturer and confirmation that the supplied GCL is fit for purpose;

(c) details the CQA procedures and testing undertaken on the anaerobic zone GCL;

(d) confirms that the minimum requirements contained within Schedule 3 and condition 1 have been met; and

(e) be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person.

Environmental compliance reporting

6. The works approval holder must within 30 calendar days of each works stage specified in Table 1 being completed;

(a) undertake an audit of their compliance with the requirements of condition 1; and

(b) prepare and submit to the CEO an Environmental Compliance Report on that compliance.

7. The Environmental Compliance Report required by condition 6, must include as a minimum the following;

(a) certification by a suitably qualified civil engineer that the items of infrastructure or component(s) thereof, as specified in condition 1, have been constructed in accordance with the relevant requirements specified in condition 1;

(b) as constructed plans and a detailed site plan for each item of infrastructure or component of infrastructure specified in condition 1;

(c) labelled photographic evidence of the installation of the infrastructure; and

(d) be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person.

Environmental commissioning phase

Environmental commissioning requirements

8. The works approval holder may only commence environmental commissioning of a works stage specified in Table 1 once;

(a) the Environmental Compliance Report for that works stage has been submitted in accordance with condition 6 of this works approval; and

(b) the requirements of condition 3 have been met.

9. Any environmental commissioning activities undertaken for a works stage specified in Table 2 may only be carried out;

(a) in accordance with the corresponding commissioning requirements; and

(b) for the corresponding authorised commissioning duration.

Table 2: Environmental commissioning requirements

Works stage	Commissioning requirements	Authorised commissioning duration
Stage 1	(a) All pipework, fittings and pumps must be hydraulically tested to the required pressure and deemed fit for purpose prior to use.	For a period not exceeding 12 months in aggregate
Stage 2	(a) All pipework, fittings and pumps must be hydraulically tested to the required pressure and deemed fit for purpose prior to use; (b) The 3 x 100 L/s rotary inclined screens must be tested and deemed fit for purpose prior to use; and (c) The existing inlet screens must not be decommissioned until the above requirement has been met.	For a period not exceeding 2 months in aggregate
Combined Stage 1 and Stage 2	(a) Treatment throughput must not exceed 4,770 m^3/day.	For a period not exceeding 6 months in aggregate

Environmental commissioning report

10. The works approval holder must submit to the CEO an Environmental Commissioning Report within 30 calendar days of the completion date of environmental commissioning specified in condition 9.

11. The works approval holder must ensure the Environmental Commissioning Report required by condition 10 of this works approval includes the following;

(a) a summary of the environmental commissioning activities undertaken, including timeframes and amount of sewage received and processed;

(b) the point-source emissions monitoring results recorded during environmental commissioning in accordance with condition 19;

(c) a summary of the environmental performance of each item of infrastructure or equipment as constructed or installed, which at minimum includes records detailing the;

(i) hydro-testing of pipelines, fittings and pumps;
(ii) testing of any installed high-level alarms or pump failure alarms;
(iii) commissioning and process optimisation of the pond system;
(iv) commissioning of the process control system; and
(v) compliance with the emissions and discharge limits specified in condition 18.

(d) a review of the works approval holder's performance and compliance against the conditions of this works approval; and

(e) where they have not been met, measures proposed to meet the manufacturer's design specifications and the conditions of this works approval, together with timeframes for implementing the proposed measures.

Time limited operations phase

Time limited operations requirements

12. The works approval holder may only commence time limited operations for an item of infrastructure identified in condition 1;

(a) where the corresponding works stage is not authorised to undertake environmental commissioning, the Environmental Compliance Report as required by condition 6 has been submitted by the works approval holder for that works stage; and

(b) where the corresponding works stage is authorised to undertake environmental commissioning under condition 9, the Environmental Commissioning Report as required by condition 10 has been submitted by the works approval holder.

13. The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 14:

(a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 12 for that item of infrastructure; or

(b) until such time as a licence for that item of infrastructure is granted in accordance with Part V of the Environmental Protection Act 1986.

14. During time limited operations, the works approval holder must ensure that the premises infrastructure and equipment listed in Table 3 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 3.

Table 3: Infrastructure and equipment requirements during time limited operations

	Site infrastructure and equipment	Operational requirement	Infrastructure location
1.	Inlet screening area	(a) Grit and screenings must be contained within a sealed bin prior to removal from the premises for off-site disposal to an appropriately licensed facility; (b) Concrete bunding and hardstands must be maintained to prevent surface run-off and achieve a permeability of less than 1×10^{-9} m/s; and (c) Leaks, spills and runoff from grit and screenings removal and storage must be returned to Pond 1 or Pond 2.	Figure 2
2.	Pond 1	(a) Must be maintained to achieve a permeability less than 2×10^{-10} m/s; (b) Must be maintained to a minimum freeboard level of 500 mm; (c) Overtopping of the pond must not occur; and (d) Vegetation and floating debris (emergent or otherwise) must be prevented from encroaching onto pond surfaces or inner pond embankments.	Figure 2
3.	Pond 2	(a) Must be maintained to achieve a permeability less than 2×10^{-10} m/s; (b) Must be maintained to a minimum freeboard level of 500 mm; (c) Overtopping of the pond must not occur; and (d) Vegetation and floating debris (emergent or otherwise) must be prevented from encroaching onto pond surfaces or inner pond embankments.	Figure 2
4.	Sludge drying beds	(a) Sludge removed from Pond 1 and Pond 2 must be contained within the Sludge drying beds; (b) Dewatered sludge must be removed from the premises for off-site disposal to an appropriately licensed facility; (c) Leachate from the dewatering process must be returned to Pond 1 or Pond 2; and (d) Concrete bunding must be maintained to prevent surface run-off.	Figure 2
5.	2 x Treated wastewater disinfection tanks	(a) Must be maintained free of leaks, defects and be fit for purpose; and (b) Overflows from the tanks must be returned to the pond system.	Figure 2

	Site infrastructure and equipment	Operational requirement	Infrastructure location
6.	Pivot 3	(a) Prior to seeding, treated wastewater must only be discharged to Pivot 3 to provide soil moistening in preparation for seeding; (b) Discharge of treated wastewater for soil moistening must not occur for longer than 14 consecutive days; (c) Following seeding and establishment, vegetation cover must be maintained over the irrigation area; (d) Run-off, spray drift or discharge must not occur beyond the premises boundary; (e) Discharges of treated wastewater must not occur immediately prior to, during and immediately after a rainfall event or on land that is waterlogged; and (f) Treated wastewater must be evenly distributed so that no ponding or pooling occurs.	Figure 3

Time limited operations report

15. The works approval holder must submit to the CEO a report on the time limited operations within 30 calendar days of the completion date of time limited operations or 30 calendar days before the expiration date of the works approval, whichever is the sooner.

16. The works approval holder must ensure the report required by condition 15 includes the following;

(a) a summary of the time limited operations, including timeframes and amount of sewage received and processed;

(b) a summary of emissions and discharge monitoring results obtained during time limited operations under condition 19;

(c) a summary of the environmental performance of all infrastructure as constructed or installed (as applicable), which includes records detailing the;

(i) volume of waste types disposed from the premises; and
(ii) compliance with the emissions and discharge limits specified in condition 18;

(d) a review of performance and compliance against the conditions of the works approval and the Environmental Commissioning Report; and

(e) where the manufacturer's design specifications and the conditions of this works approval have not been met, what measures will the works approval holder take to meet them, and what timeframes will be required to implement those measures.

Emissions and discharges

Emissions and discharge requirements

17. During environmental commissioning and time limited operations, the works approval holder must ensure that the emission specified in Table 4, is discharged only from the corresponding discharge points and only at the corresponding discharge point locations.

Table 4: Authorised discharge point

Emission	Discharge points	Discharge point locations
Treated wastewater	Pivot 1, Pivot 2 and Pivot 3	As depicted in Schedule 1 Figure 3
	Seedling Irrigation area	

18. During environmental commissioning and time limited operations, the works approval holder must ensure that the emissions from the discharge points listed in Table 5 do not exceed the corresponding limits when monitored in accordance with condition 19.

Table 5: Emission and discharge limits

Discharge points	Parameter	Limit
Pivot 1 Pivot 2 Pivot 3 Seedling Irrigation area	TN	500 kg/ha/year inclusive of irrigation conducted under L9094/2017/1 for that annual period
	TP	224 kg/ha/year inclusive of irrigation conducted under L9094/2017/1 for that annual period

Monitoring

19. The works approval holder must monitor emissions during environmental commissioning and time limited operations in accordance with Table 6.

Table 6: Emissions and discharge monitoring

Monitoring point	Monitoring point location	Parameter	Unit	Frequency	Averaging period	Method
S3002405	As depicted in Schedule 1 Figure 4	pH[1]	-	Monthly[2]	Spot sample	AS/NZS 5667.10
		Oil and grease	mg/L			
		TDS				
		TSS				
		TN				
		TP				
		BOD				
		NO_x - N				

Monitoring point	Monitoring point location	Parameter	Unit	Frequency	Averaging period	Method
S3002405 (cont)		NH_4 - N				
		TKN				
		FRP				
		Arsenic				
		Cadmium				
		Copper				
		Chromium				
		Lead				
		Mercury				
		Nickel				
		Zinc				
		E. coli	CFU or MPN / 100 mL			
S3002406	As depicted in Schedule 1 Figure 4	*E. coli*				
		Total residual chlorine[1]	mg/L			
		TN				
		TP				
Effluent flow meter	As depicted in Schedule 1 Figure 4	Volumetric flow rate (cumulative)	m^3 / day	Continuous	Monthly	Flow meter
S3002136						

Note 1: In-field non-NATA accredited analysis is permitted.

Note 2: Sample collection for successive monthly monitoring must take place at least 15 days apart.

20. The works approval holder must ensure that all non-continuous analysis undertaken pursuant to condition 19 is performed by a holder of a current accreditation from the National Association of Testing Authorities (NATA) for the methods of analysis relevant to the corresponding parameter.

Records and reporting (general)

21. The works approval holder must record the following information in relation to complaints received by the works approval holder (whether received directly from a complainant or forwarded to them by the Department or another party) about any alleged emissions from the premises;

(a) the name and contact details of the complainant, (if provided);

(b) the time and date of the complaint;

(c) the complete details of the complaint and any other concerns or other issues raised; and

(d) the complete details and dates of any action taken by the works approval holder to investigate or respond to any complaint.

22. The works approval holder must maintain accurate and auditable books including the following records, information, reports, and data required by this works approval;

(a) the works conducted in accordance with condition 1;

(b) any maintenance of infrastructure that is performed in the course of complying with condition 1, 9 and 14;

(c) monitoring programs undertaken in accordance with condition 19; and

(d) complaints received under condition 21.

23. The books specified under condition 22 must;

(a) be legible;

(b) if amended, be amended in such a way that the original version(s) and any subsequent amendments remain legible and are capable of retrieval;

(c) be retained by the works approval holder for the duration of the works approval; and

(d) be available to be produced to an inspector or the CEO as required.

Definitions

In this works approval, the terms in Table 7 have the meanings defined.

Table 7: Definitions

Term	Definition
annual period	has the same meaning given to that term under licence L9094/2017/1
AS/NZS 5667.10	means the Australian Standard *AS/NZS 5667.10 Water quality – Sampling Guidance on sampling of waste waters*.
BOD	biochemical oxygen demand
books	has the same meaning given to that term under the EP Act.
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department administering the *Environmental Protection Act 1986* Locked Bag 10 Joondalup DC WA 6919 info@dwer.wa.gov.au
CFU	colony forming units
condition	a condition to which this works approval is subject under section 62 of the EP Act.
Critical Containment Infrastructure Report	means a report to satisfy the CEO that works on the Pond 2 anaerobic zone required by Table 1: Row 1(b) have been constructed in accordance with the works approval and had that construction quality assured through testing.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V Division 3 of the EP Act.
discharge	has the same meaning given to that term under the EP Act.
E. coli	*Escherichia coli*
emission	has the same meaning given to that term under the EP Act.
environmental commissioning	means the sequence of activities to be undertaken to test equipment integrity and operation, or to determine the environmental performance, of equipment and infrastructure to establish or test a steady state operation and confirm design specifications.
Environmental Commissioning Report	means a report on any commissioning activities that have taken place and a demonstration that they have concluded, with focus on emissions and discharges, waste containment, and other environmental factors.
Environmental Compliance Report	means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or installed in accordance with the works approval.
EP Act	*Environmental Protection Act 1986* (WA).
EP Regulations	*Environmental Protection Regulations 1987* (WA).

Term	Definition
FRP	filterable reactive phosphorous
MPN	most probable number
NH_4 - N	ammonium as nitrogen
NO_x - N	nitrate + nitrite as nitrogen
premises	the premises to which this works approval applies, as specified at the front of this works approval and as shown on the premises map (Figure 1) in Schedule 1 to this works approval.
prescribed premises	has the same meaning given to that term under the EP Act.
Suitably qualified civil engineer	means a person who: a) holds a Bachelor of Engineering recognised by Engineers Australia; b) has a minimum of five years of experience working in a supervisory area of civil engineering; and c) is an independent third party external to the works approval holder; or d) is otherwise approved in writing by the CEO to act in this capacity
Suitably qualified person	means a person who: a) holds a Bachelor of Engineering recognised by Engineers Australia; b) has a minimum of five years of experience working in a supervisory area of liner construction quality assurance; and c) is an independent third party external to the works approval holder; or d) is otherwise approved in writing by the CEO to act in this capacity
TDS	total dissolved solids
time limited operations	refers to the operation of the infrastructure and equipment identified under this works approval that is authorised for that purpose, subject to the relevant conditions.
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
works approval	refers to this document, which evidences the grant of the works approval by the CEO under section 54 of the EP Act, subject to the conditions.
works approval holder	refers to the occupier of the premises being the person to whom this works approval has been granted, as specified at the front of this works approval.

END OF CONDITIONS

Schedule 1

Premises maps

The boundary of the prescribed premises is shown in the map below (Figure 1).

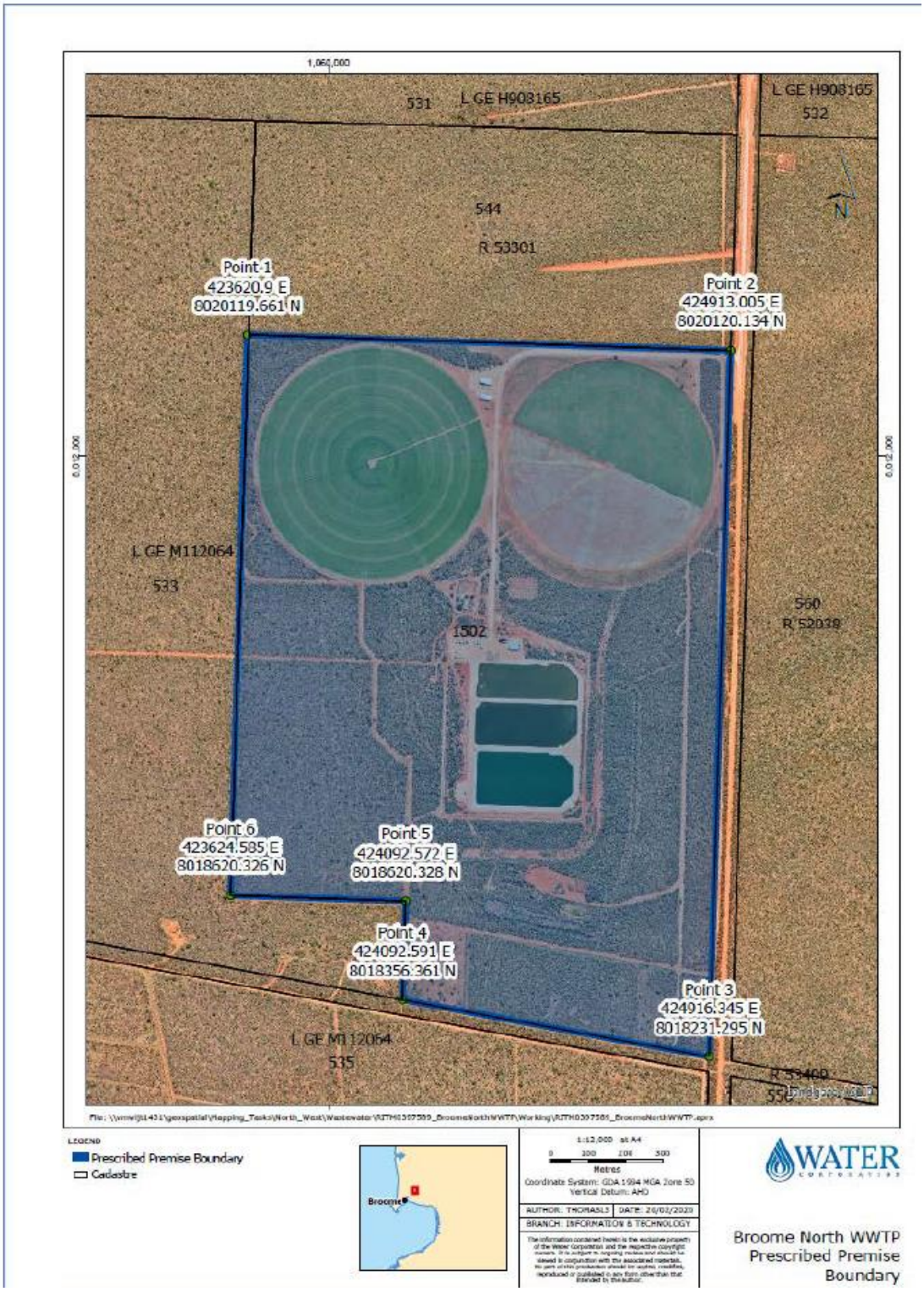

Figure 1: Map of the boundary of the prescribed premises

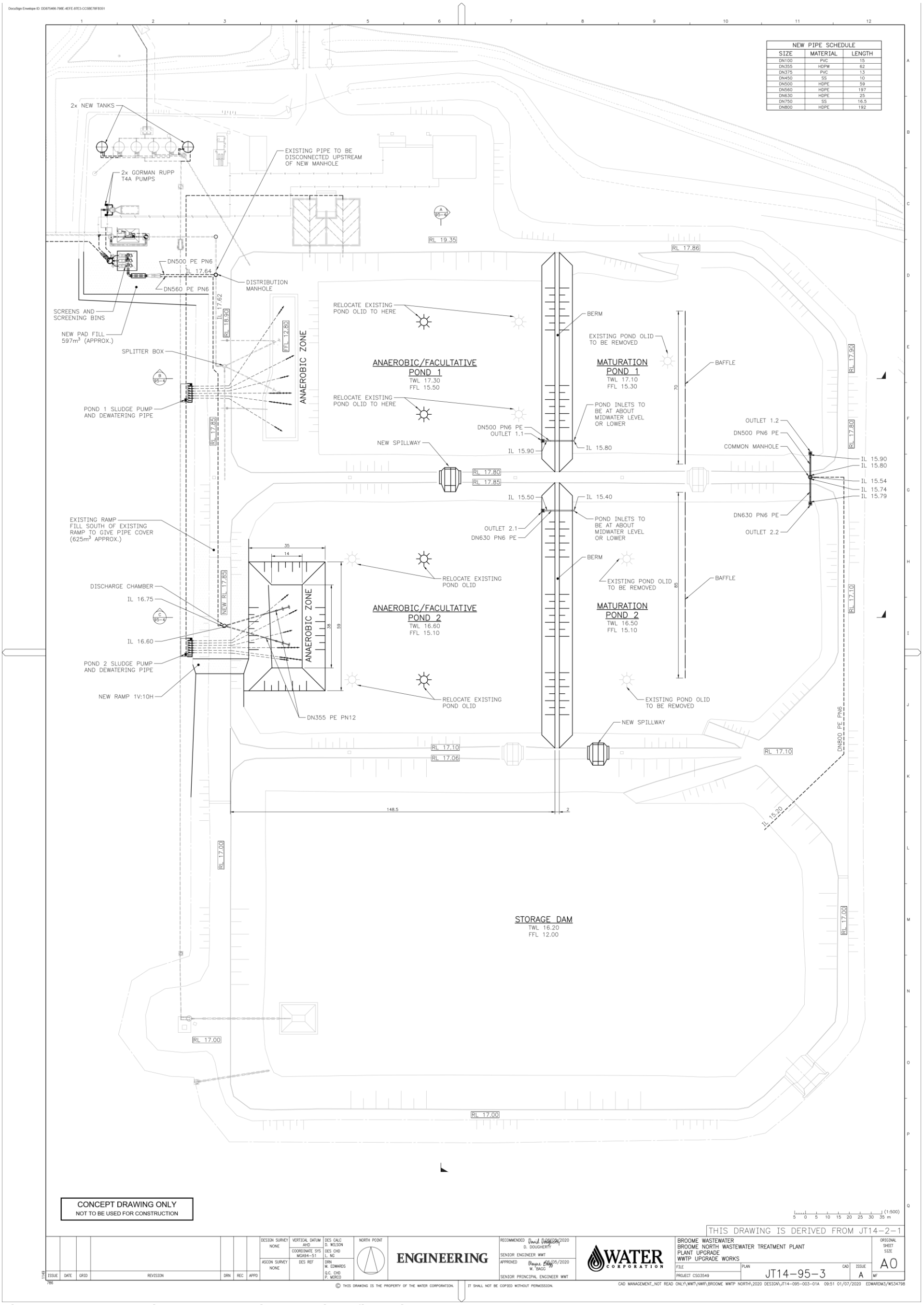

Figure 2: Broome North WWTP Upgrade to pond configuration

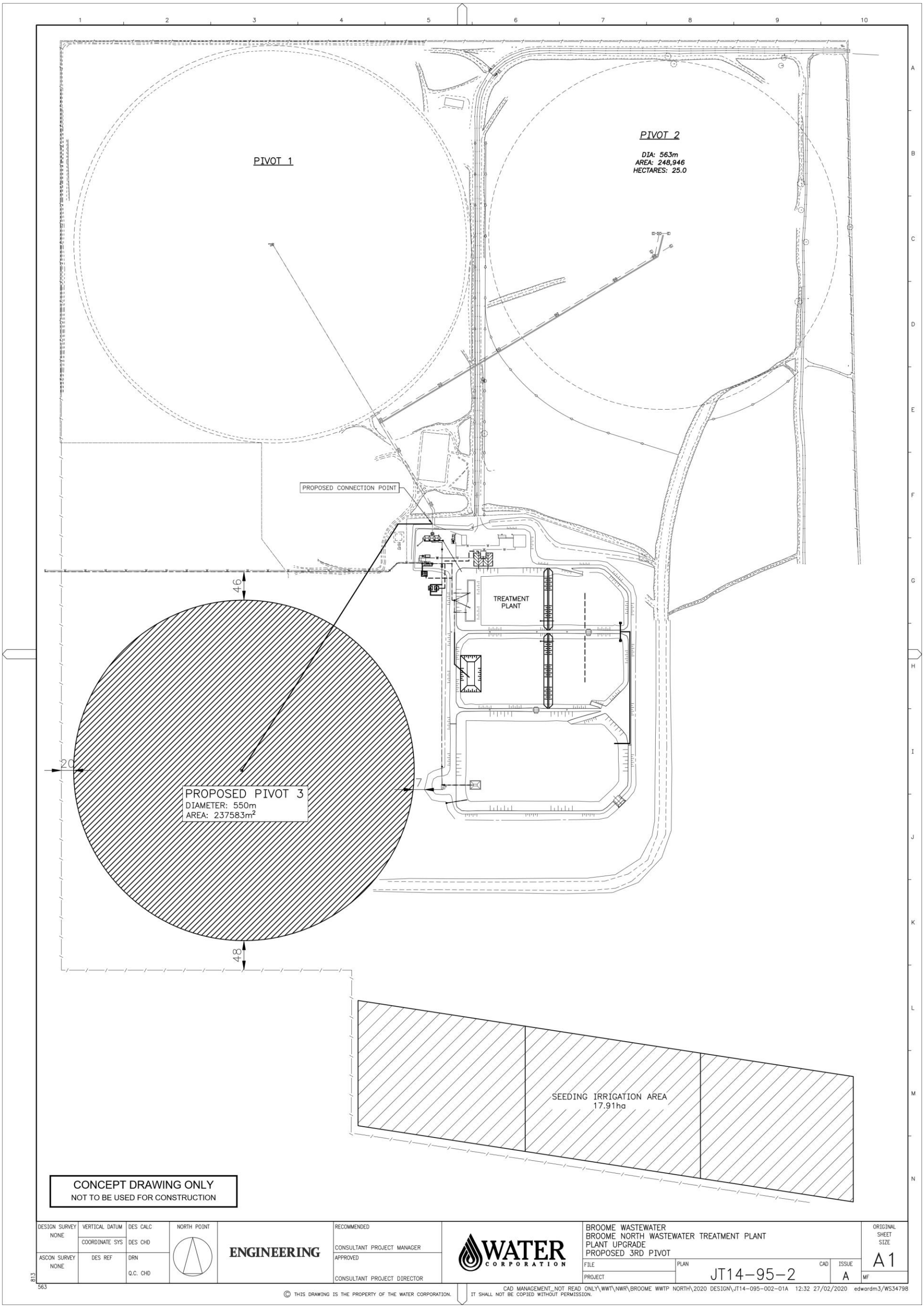

Figure 3: Broome North Wastewater irrigation lines schematic diagram

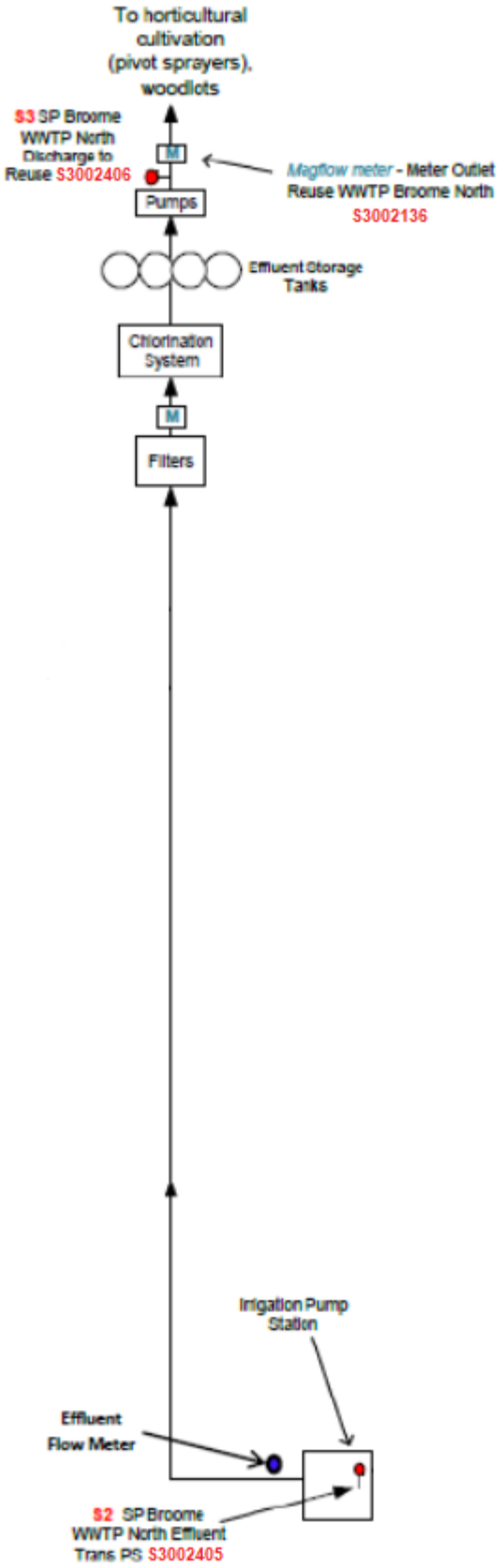

Figure 4: Monitoring point locations during environmental commissioning

Schedule 2

Premises boundary

The premises boundary is defined by the coordinates in Table 8.

Table 8: Premises boundary coordinates (GDA 94 MGA Zone 51)

Easting	Northing
423620.9	8020119.661
424913.005	8020120.005
424916.345	8018231.295
424092.591	8018356.361
424092.572	8018620.328
423624.585	8018620.326

Schedule 3

Geosynthetic Clay Liner Specifications

Table 9: GCL specifications

Item	Requirements
Manufacturing Quality Assurance	Prior to installation of the GCL, the works approval holder must; a) obtain a quality control report from the GCL manufacturer; b) The quality control report must verify that the supplied GCL meets the minimum requirements for; (i) sodium bentonite property; and (ii) material property, as set out in the manufacturer's technical information document.
Side-wall subgrade preparation	Prior to installation of the GCL, the works approval holder must; a) excavate all unsuitable materials to a minimum depth of -300 mm from the final surface level; b) replace all removed material with engineered fill to form a suitable subgrade; c) ensure the subgrade is compacted to a Standard Maximum Dry Density (SMDD) of at least 95% and Optimum Moisture Content (OMC) of -2% to +2%; d) ensure that the top 150 mm of the subgrade has a particle size distribution where at least 80% of the soil is finer than 0.2 mm; e) ensure that subgrade is free from debris, vegetation, roots, sticks, sharp rocks, or other deleterious materials larger than 10 mm in any dimension, as well as free of any voids, large cracks or standing water; and f) ensure that the subgrade is final-graded to fill remaining voids or desiccation cracks and proof-rolled. The surface must be maintained in this smooth condition.
Geosynthetic Clay Liner	The Geosynthetic Clay Liner must be installed to the following specifications; a) must not be installed during rainfall or in the presence of standing water on the subgrade; b) must cover the entire anaerobic zone side-wall; c) must be adequately joined and sealed with the existing GCL so that no water is able to pass through the join; d) must be adequately joined and sealed with the concrete base of the anaerobic zone pit so that no water is able to pass through the join; e) must be placed so that no folds or wrinkles are present in the overlap zone; f) the overlap zone must be no less than 300 mm along panel edges; g) must be in direct contact with the subgrade; h) must have a hydraulic conductivity no greater than 2×10^{-10} m/s; i) must be free of holes, blisters, blemishes, striations, bubble, roughness, contaminants and permanently attached raw materials; and j) in accordance with any additional minimum requirements specified by the manufacturer.

Item	Requirements
Inspection and repair	Following installation of the GCL, the works approval holder must; a) identify any damage to the GCL by inspecting the surface of the GCL for rips, tears, displaced panels and premature hydration; b) conduct appropriate repairs to any damage identified through the inspection; and c) document the results of the inspection, and if required, any repairs done to the GCL.