Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works approval number	W6775/2023/1
Works approval holder	Department of Communities
Registered business address	5 Newman Court Fremantle WA 6160
DWER file number	DER2023/000068
Duration	23/06/2023 to 22/06/2028
Date of issue	23/06/2023
Premises details	Yungngora Wastewater Treatment Plant Legal description – Part of Lot 255 on Deposited Plan 220190, Crown Lease PL N-049848 As defined by the coordinates in Schedule 2

Prescribed premises category description (Schedule 1, Environmental Protection Regulations 1987)	Assessed production capacity
Category 54: Sewage facility	150 m^3 per day

This works approval is granted to the works approval holder, subject to the attached conditions, on 8 December 2023 by:

Steve Checker

Digitally signed by Steve Checker
Date: 2023.12.08 18:47:43 +08'00'

Steve Checker
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.

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) design and construct the infrastructure;

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

(c) at the corresponding infrastructure location

as set out in Table 1.

Table 1: Design and construction requirements

Infrastructure		Design and construction requirements	Infrastructure location
1.	Wastewater treatment plant (WWTP)	(a) Must be able to receive and treat a sewage inflow of up to 150 m^3/day; (b) Designed and constructed to achieve an operational freeboard height of 500 mm and with sufficient capacity to contain a 1 in 10-year 72-hour storm event; (c) All internal pond embankments must have a slope angle no steeper than 3 horizontal to 1 vertical (3H:1V); (d) The base of all ponds and drying beds must be located more than 2 m above the maximum wet season water table in the alluvial aquifer; (e) Pipework, fittings, and joints are to be constructed of impervious material that is free from leaks and/or defects; (f) All ponds, beds, pipework, fittings, and joints must be designed and constructed to ensure that stormwater does not enter the WWTP; (g) All chemicals must be stored separately within an above ground vessel/s that is contained within bunds of a capacity of 110% of the total vessel/s contents; (h) All pipework, fittings and pumps must be tested and visually inspected to confirm they are free from leaks and defects prior to use; and (i) A 1.8 m high perimeter fence and lockable access gates must be installed around the boundary of the WWTP to prevent unauthorised access.	As shown in Figure 2 of Schedule 1

Infrastructure		Design and construction requirements	Infrastructure location
2.	Primary pond 1 and 2	(a) Must be lined with a minimum 1.5 mm thick HDPE liner that has a permeability of less than 2 x 10^{-10} m/s or equivalent; (b) Geosynthetic liner material must be single-sided textured HDPE and meet the minimum requirements listed in Table 2(b) of the *GRI - GM13 Standard Specification* for the relevant thickness of HDPE liner; (c) Subgrade preparation and HDPE liner installation must be in accordance with the minimum requirements contained in Table 6 of Schedule 3 and the minimum quality requirements contained in Table 7 of Schedule 4; (d) Must be constructed to receive inflow so that both ponds operate in parallel; and (e) Must be constructed to direct outflow from each pond to the secondary pond in a manner that provides maximum retention time within the primary ponds.	As shown in Figure 2 of Schedule 1
3.	Secondary pond	(a) Must be lined with a minimum 1.5 mm thick HDPE liner that has a permeability of less than 2 x 10^{-10} m/s or equivalent; (b) Geosynthetic liner material must be single-sided textured HDPE and meet the minimum requirements listed in Table 2(b) of the *GRI - GM13 Standard Specification* for the relevant thickness of HDPE liner; (c) Subgrade preparation and HDPE liner installation must be in accordance with the minimum requirements contained in Table 6 of Schedule 3 and the minimum quality requirements contained in Table 7 of Schedule 4; and (d) Must be constructed to direct treated wastewater outflow to evaporation pond 1 in a manner that provides maximum retention time within the secondary pond.	As shown in Figure 2 of Schedule 1
4.	Evaporation pond 1 and 2	(a) Internal embankments must be lined with a HDPE liner; and (b) Must be connected via a pipeline in the shared embankment wall.	As shown in Figure 2 of Schedule 1
5.	Septage drying bed	(a) Must be lined with a geosynthetic clay liner that has a permeability of less than 2 x 10^{-10} m/s or equivalent; and (b) Must be constructed with an underdrainage system connected to the primary ponds, that is laid at an appropriate grade to ensure liquid from the drying bed drains to the primary ponds.	As shown in Figure 2 of Schedule 1

Construction quality assurance

2. Prior to construction of the works, the works approval holder must prepare a Construction Quality Assurance Plan that provides procedures for identifying non-conformances with technical specifications and the requirements of condition 1.

3. The Construction Quality Assurance Plan required by condition 2, must include as a minimum the following:

(a) descriptions of responsibilities, qualifications and obligations for each party involved in the plan and the proposed level of supervision for liner construction and installation;

(b) material testing information, including sampling locations, frequency of testing, test methods, laboratories, accreditations, applicable specifications and quality standards, data evaluation, acceptance and rejection criteria, and contingency measures in the event of failure;

(c) hold and inspection points for key stages of the work that cannot later be rectified because they will no longer be accessible;

(d) manufacturing quality control including factory test results, certifications and material warranties that meet the minimum requirements listed in Table 7 of Schedule 4;

(e) independent conformance testing that meets the minimum requirements listed in Table 7 of Schedule 4, to verify that the materials supplied comply with the minimum requirements;

(f) subgrade preparation and liner installation procedures that meet the minimum requirements listed in Table 6 of Schedule 3, including storage to protect from weather and other damage during installation, panel overlaps, welds, jointing and seam orientation in accordance with good practice and the manufacturer's instructions, regular inspections, repairs tested and recorded and any protection from UV light after installation; and

(g) reporting and record keeping requirements.

Compliance reporting

4. The works approval holder must within 30 calendar days of the infrastructure or equipment required by condition 1 being constructed and/or installed:

(a) undertake an audit of their compliance with the 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 include as a minimum the following:

(a) certification by a suitably qualified civil engineer that each item of infrastructure or component thereof, as specified in condition 1, have been constructed and installed in accordance with the minimum requirements specified in condition 1 and Table 6 of Schedule 3;

(b) a Construction Quality Assurance Report from an independent third party that:

(i) is written and certified by a suitably qualified CQA engineer/consultant who has undertaken CQA on the completed works for the compacted subgrade and HDPE liner;
(ii) details the CQA procedures and testing undertaken for the compacted subgrade and HDPE liner;
(iii) confirms the preparation of the subgrade and installation of the HDPE liner have met the minimum requirements contained in Table 6 of Schedule 3 and the relevant requirements specified in condition 1;
(iv) confirms the quality control and assurance measures contained in Table 7 of Schedule 4 have been completed and that satisfactory results have been demonstrated;
(v) includes evidence of quality assurance and conformance testing works; and
(vi) certifies that the subgrade and liner are free of fault or defect, built to the design specification and fit for the intended purpose;

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

(d) photographic evidence of the installation of the infrastructure;

(e) evidence that pipework, fittings and pumps have been tested and inspected to ensure the infrastructure is fit for purpose prior to use;

(f) a description of, and explanation for, any departure from the requirements in condition 1; and

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

Time limited operations phase

Commencement

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

(a) where the Critical Containment Infrastructure Report as required by condition 4 has been submitted by the works approval holder for that item of infrastructure; and

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

(c) where at least 10 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.

7. The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 8:

(a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 6 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*, if one is granted before the end of the period specified in condition 7(a).

Time limited operations requirements

8. During time limited operations, the works approval holder must ensure that the premises infrastructure and equipment listed in Table 2 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 2.

Table 2: Infrastructure and equipment requirements during time limited operations

Infrastructure and equipment		Operational requirements	Infrastructure location
1.	Wastewater treatment plant (WWTP)	(a) Must not receive more than 150 m^3/day of sewage inflow; (b) A top of embankment freeboard height equal to or greater than 500 mm must be maintained on all ponds; (c) Overtopping of the ponds must not occur; (d) The integrity of all containment infrastructure and pipelines must be maintained; (e) Vegetation and floating debris must be prevented from encroaching onto pond surfaces or inner pond embankments; and (f) A 1.8 m high perimeter fence and lockable access gates must be maintained around the boundary of the WWTP to prevent unauthorised access.	As shown in Figure 2 of Schedule 1
2.	Primary pond 1 and 2	(a) A minimum 1.5 mm thick HDPE liner with a permeability of less than 2 x 10^{-10} m/s must be maintained at all times; (b) Must be operated in parallel; and (c) Outflow from each pond must be directed to the secondary pond.	As shown in Figure 2 of Schedule 1
3.	Secondary pond	(a) A minimum 1.5 mm thick HDPE liner with a permeability of less than 2 x 10^{-10} m/s must be maintained at all times; and (b) Outflow from the pond must be directed to evaporation pond 1.	As shown in Figure 2 of Schedule 1

Infrastructure and equipment		Operational requirements	Infrastructure location
4.	Evaporation pond 1 and 2	(a) A HDPE liner must be maintained on internal embankments at all times; and (b) The base of the ponds must be maintained to prevent cracking, drying and/or vegetation growth.	As shown in Figure 2 of Schedule 1
5.	Septage drying bed	(a) A geosynthetic clay liner with a permeability of less than 2 x 10^{-10} m/s must be maintained at all times; and (b) Leachate from the drying bed must be collected and drained to the primary ponds.	As shown in Figure 2 of Schedule 1
6.	Temporary Evaporation Bund	150m x 150m x 0.5m	As shown in Figure 3 of Schedule 1

Monitoring during time limited operations

9. The licence holder must record the total amount of sewage inflow to the premises according to the specifications set out in Table 3.

Table 3: Monitoring of inputs

Equipment	Unit	Frequency	Averaging period
Inflow meter	kL or m^3/day	Continuous	Monthly

Time limited operations compliance reporting

10. 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.

11. The works approval holder must ensure the report required by condition 10 includes the following:

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

(b) a summary of the environmental performance of all infrastructure as constructed or installed;

(c) a review of performance and compliance against the conditions of the works approval; and

(d) 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.

Records and reporting (general)

12. 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.

13. 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 and 8;

(c) complaints received under condition 12.

14. The books specified under condition 13 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 4 have the meanings defined.

Table 4: Definitions

Term	Definition
annual period	a 12-month period commencing from 1 July until 30 June of the immediately following year
ASTM D792	means the ASTM International Standard ASTM D792 Standard Test Methods for Density and Specific Gravity (relative Density) of Plastics by Displacement
ASTM D1004	means the ASTM International Standard ASTM D1004 Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
ASTM D1505	means the ASTM International Standard ASTM D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D1603	means the ASTM International Standard ASTM D1603 Standard Test Method for Carbon Black Content in Olefin Plastics
ASTM D4833	means the ASTM International Standard ASTM D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
ASTM D5397	means the ASTM International Standard ASTM D5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
ASTM D5596	means the ASTM International Standard ASTM D5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
ASTM D5885	means the ASTM International Standard ASTM D5885 Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry
ASTM D5994	means the ASTM International Standard ASTM D5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes
ASTM D6693	means the ASTM International Standard ASTM D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembrane
ASTM D7466	means the ASTM International Standard ASTM D7466 Standard Test Method for Measuring the Asperity Height of Textured Geomembranes
ASTM D8117	means the ASTM International Standard ASTM D8117 Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by Differential Scanning Calorimetry
books	has the same meaning given to that term under the EP Act

Term	Definition
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
CQA	construction quality assurance
construction quality assurance	means a planned system of activities that provide assurance that the subgrade and geomembrane were fabricated and installed in accordance with the requirements of the works approval and technical specifications
Construction Quality Assurance Plan	means a plan that provides procedures and activities to be undertaken to ensure the installation of liner materials meets the required technical specifications and works approval requirements, including identification of non-conformances and corrective actions to be undertaken
Critical Containment Infrastructure Report	means a report to satisfy the CEO that works of critical containment infrastructure have been constructed in accordance with the works approval
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
emission	has the same meaning given to that term under the EP Act
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	Environmental Protection Regulations 1987 (WA)
GRI - GM13 Standard Specification	means the Geosynthetic Research Institute GM13 Standard Specification for Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
HDPE	high density polyethylene
premises	the premises to which this licence applies, as specified at the front of this licence 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

Term	Definition
suitably qualified civil engineer	means a person who: (a) holds a Bachelor of Engineering recognised by Engineers Australia; and (b) has a minimum of five years of experience working in a supervisory area of civil or structural engineering; or is otherwise approved in writing by the CEO to act in this capacity
suitably qualified CQA engineer/consultant	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 construction quality assurance; and (c) is employed by an independent third-party external to the works approval holder's business and liner installation contractor; or is otherwise approved in writing by the CEO to act in this capacity
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
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
WWTP	wastewater treatment plant

END OF CONDITIONS

Schedule 1: Maps

Premises map

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

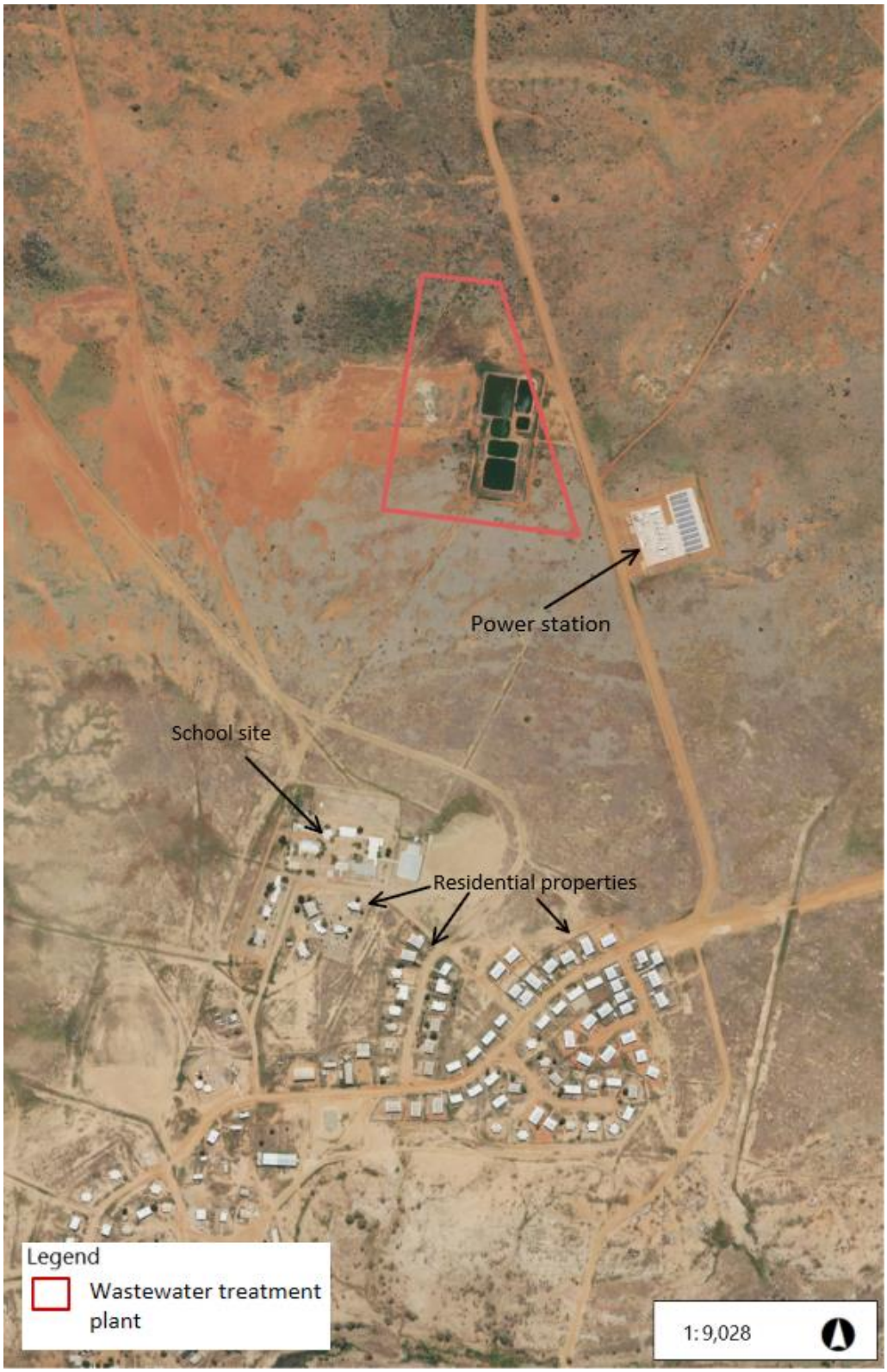

Figure 1: Map of the boundary of the prescribed premises

Site layout and arrangement

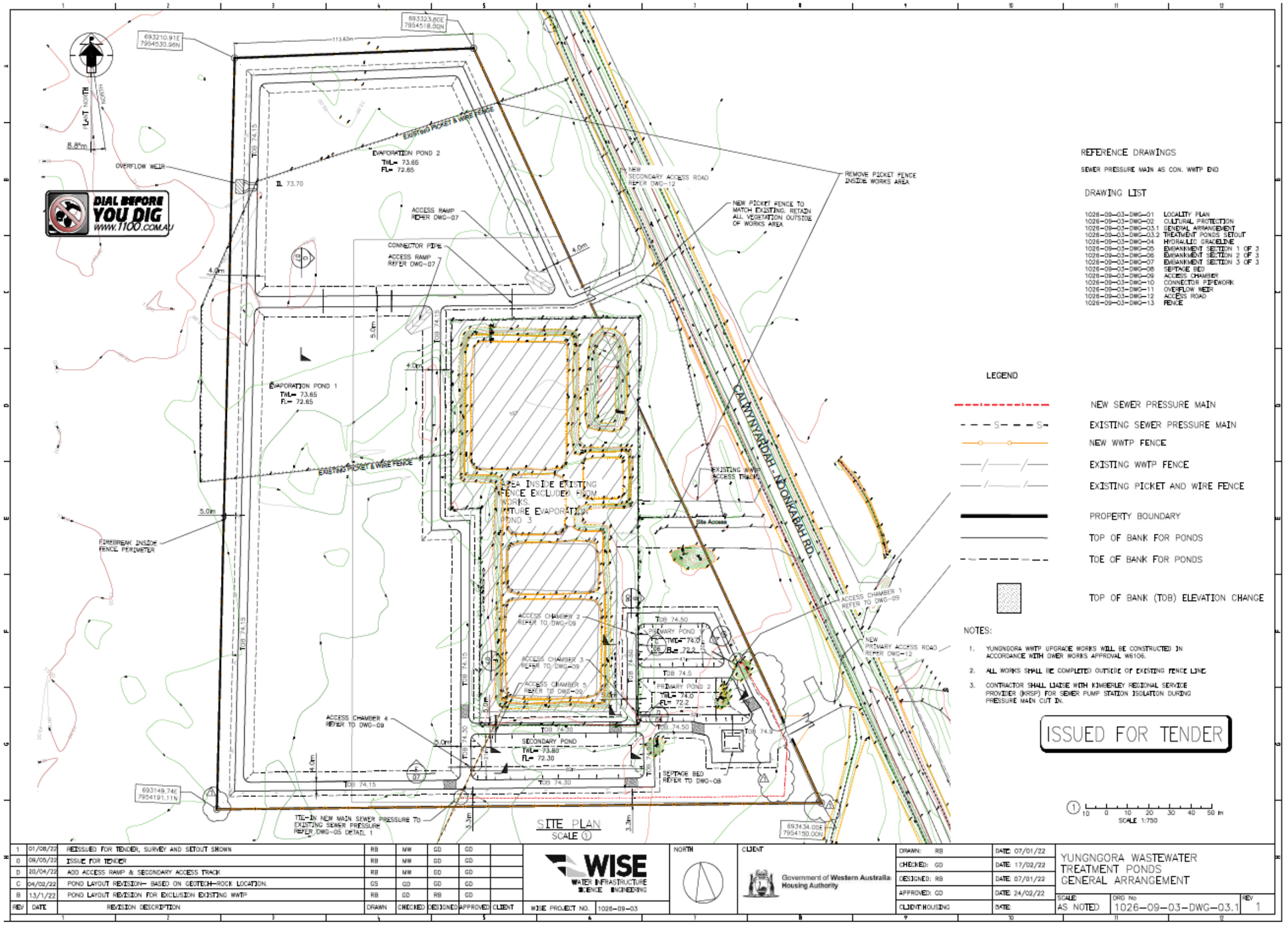

Figure 2: Layout and general arrangement of the works

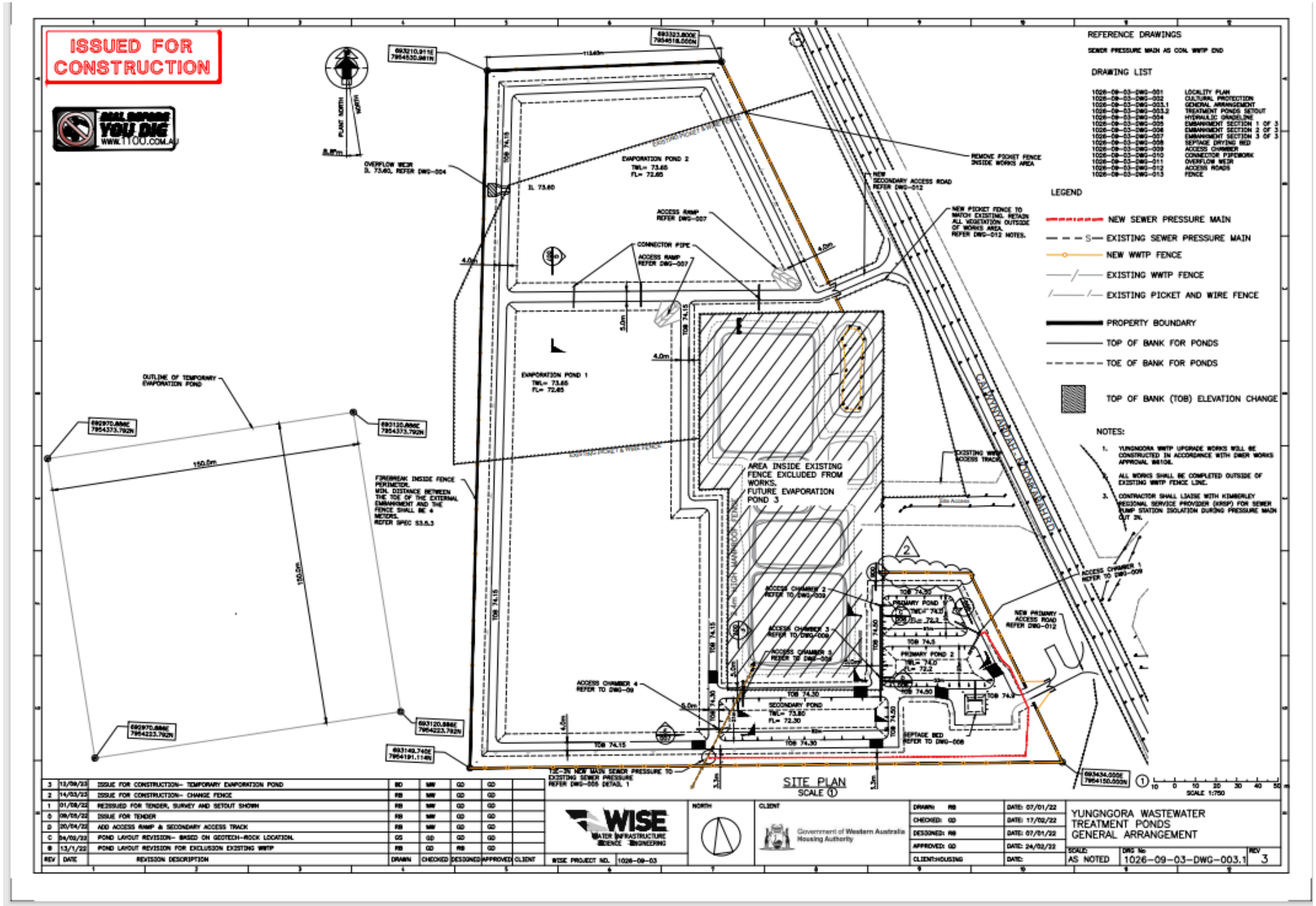

Figure 3: Layout of temporary evaporation bund

Schedule 2: Premises boundary

The vertices of the premises boundary are the coordinates listed in Table 5.

Table 5: Premises boundary coordinates (GDA2020 Zone 50)

Point	Easting	Northing
1.	693210.91	7954530.96
2.	693323.80	7954518.00
3.	693149.74	7954191.11
4.	693434.11	7954150.00

Schedule 3: Liner installation requirements

In accordance with condition 1, the items and corresponding requirements described in Table 6 are the minimum requirements to be met and/or completed for the installation of the HDPE liner material in primary ponds 1 and 2, and the secondary pond.

Table 6: Minimum requirements for installation of pond HDPE liners

Item		Requirements
1.	Pond base and embankment subgrade preparation	Prior to installation of the HDPE liner, the works approval holder must; (a) Excavate all unsuitable materials to a minimum depth of -300 mm from the final surface level (FSL) of the pond and replace with engineered fill material to FSL to form a suitable subgrade; (b) Moisture condition and compact the subgrade to a Standard Maximum Dry Density (SMDD) of 95% and Optimum Moisture Content (OMC) of -2% to +2%; (c) Ensure the 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; (d) Conduct final grading of the subgrade to fill remaining voids or desiccation cracks and proof roll the entire footprint including pond floor and embankments using a smooth drum roller; and (e) Ensure the prepared subgrade is protected from desiccation and flooding, and the surface is maintained in a smooth condition prior to HDPE installation.
2.	HDPE liner installation	(a) The entire surface area of each roll must be inspected by the suitably qualified CQA engineer/consultant prior to works commencing or during unrolling/installation, to ensure that there are no tears, punctures, abrasions, indentations, cracks, thin spots or other faults in the material; (b) Installation and seaming must be undertaken by installers with extensive experience in seaming the same type of HDPE liner being installed and using the same seaming procedures to be used on site. They must hold a current independent certification for seaming and installation to a recognised industry standard (national or international); (c) The method used to unroll and deploy the panels must not score, scratch or crimp the geomembrane; (d) Must not be installed during rainfall, high winds or in the presence of standing water on the subgrade; (e) Must be installed to overlay the subgrade so that the geomembrane remains in direct contact with the subgrade, with sufficient slack given to ensure low areas in the subgrade are not bridged by the geomembrane; (f) Panel overlap zones must be no less than 100 mm and orientated so the overlap is in the down sloping direction and across the pond base; (g) Panel connecting seams between embankment and base panels must be located on the base of the pond at least 1.5 m from the toe of the embankment; (h) Panels installed on pond embankments must be fixed in anchor trenches; (i) Panels must be free of holes, blisters, blemishes, striations, bubble, roughness, contaminants and permanently attached raw materials; and (j) The installation must be undertaken in accordance with any additional minimum requirements specified by the manufacturer.

Item		Requirements
3.	Anchor trenches	(a) Must be set back at least 1.0 m from the top edge of the pond embankment; and (b) Must be backfilled with engineered fill while liner materials are in the relaxed state, in full contact with subgrade and without wrinkles or folds.
4.	Welding methods	(a) Only thermal welding methods shall be used; (b) Welding of all main joints between adjacent panels must be conducted using dual-track fusion welding; (c) Extrusion welding must only be conducted for repair work or around pipeline penetrations; and (d) Extrusion welding must be undertaken using material that has the same resin type and physical properties of the HDPE.
5.	Inspection and repair	Following installation of the HDPE liner, the works approval holder must; (a) identify any damage to the HDPE by inspecting the surface of the liner for rips, tears and displaced panels; (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 liner.

Schedule 4: Liner quality control and quality assurance requirements

The items and corresponding requirements described in Table 7 are the minimum quality control and assurance activitites that must be undertaken for the installation of the HDPE liner material in primary ponds 1 and 2, and the secondary pond.

Table 7: Minimum requirements for quality control and assurance for pond HDPE liner installation

<table>
<tr><th colspan="2">Item</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Manufacturer Quality Control and Assurance</td><td>(a) HDPE panel rolls must be supplied, tested and certified by the manufacturer in accordance with the GRI - GM13 Standard Specification to confirm that the following material properties meet the requirements of the relevant specification for the HDPE liner:
(i) Thickness, asperity height and formulated density;
(ii) Tensile properties;
(iii) Tear, puncture and stress crack resistance;
(iv) Carbon black content and dispersion;
(v) Oxidative Induction Time;
(vi) Oven aging at 85^{0}C; and
(vii) Ultra-violet resistance; and
(b) A statement on the origin of the resin used in the HDPE, its identification (type and lot number), its production date and the maximum amount of recycled polymer material added to the raw resin must be provided by the manufacturer.</td></tr>
<tr><td>2.</td><td>Conformance testing after shipment</td><td>(a) The works approval holder must undertake conformance testing of HDPE liner material prior to installation of the liner and following delivery of the HDPE liner rolls to the premises, for the properties listed below, using the corresponding test method and testing frequencies listed below.
<table>
<tr><th>Property</th><th>Test method</th><th>Testing frequency</th></tr>
<tr><td>Thickness</td><td>ASTM D5994</td><td>Each roll</td></tr>
<tr><td>Asperity Height</td><td>ASTM D7466</td><td>Two samples</td></tr>
<tr><td>Density</td><td>ASTM D1505 or ASTM D792</td><td rowspan="7">One per 5,000 m^2 or every five rolls delivered to the premises, whichever is the higher number of tests</td></tr>
<tr><td>Tensile properties in each direction
- strength at break
- strength at yield
- elongation at break
- elongation at yield</td><td>ASTM D6693 type IV</td></tr>
<tr><td>Puncture resistance</td><td>ASTM D4833</td></tr>
<tr><td>Tear resistance</td><td>ASTM D1004</td></tr>
<tr><td>Carbon black content</td><td>ASTM D1603</td></tr>
</table></td></tr>
</table>

<table>
<tr><th colspan="2">Item</th><th>Requirements</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Carbon black dispersion</td><td>ASTM D5596</td><td></td></tr>
<tr><td>Stress crack resistance</td><td>ASTM D5397</td><td rowspan="3">One sample every 10,000 m^2, resin type or manufacturing run</td></tr>
<tr><td>Standard Oxidative Induction Time</td><td>ASTM D8117</td></tr>
<tr><td>High pressure Oxidative Induction Time</td><td>ASTM D5885</td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Start-up test welds</td><td>
(a) The works approval holder must ensure that start-up test welds are undertaken using the trial weld seams listed below, at the corresponding frequency and tested using the corresponding test method listed below.
<table>
<tr><th>Trial weld seam</th><th>Frequency</th><th>Test method</th></tr>
<tr><td>Trial weld seam with a minimum continuous seam length of 1.0 m and width of 300 mm</td><td>Daily at the start of works, whenever the welding equipment is shut-off for more than 1 hour and after significant changes in weather conditions</td><td>Four 25 mm wide samples cut using a calibrated die cutter from a, tested for shear and peel strength using a calibrated hand tensiometer to determine whether the test welds have passed or failed</td></tr>
<tr><td>Trial weld seam with a minimum continuous seam length of 1.5 m and width of 300 mm</td><td>Whenever personnel or equipment are changed and/or wide temperature fluctuations are experienced.</td><td>Four 25 mm wide samples cut using a calibrated die cutter from a, tested for shear and peel strength using a calibrated hand tensiometer to determine whether the test welds have passed or failed</td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>Destructive weld testing</td><td>
(a) The works approval holder must undertake destructive weld testing for the property listed below, using the corresponding test method and testing frequencies listed below.
<table>
<tr><th>Property</th><th>Test method</th><th>Testing frequency</th></tr>
<tr><td rowspan="2">Weld seam peel and shear strength</td><td>ASTM D6392 conducted onsite using a calibrated tensiometer</td><td>Every weld</td></tr>
<tr><td>ASTM D6392 conducted offsite at a NATA accredited laboratory</td><td>Every 150 m for fusion welds and every 120 m for extrusion welds</td></tr>
</table>
</td></tr>
<tr><td>5.</td><td>Non-destructive weld testing</td><td>
(a) The works approval holder must undertake non-destructive weld testing for the properties listed below, using the corresponding test method and testing frequencies listed below.
<table>
<tr><th>Property</th><th>Test method</th><th>Testing frequency</th></tr>
<tr><td rowspan="2">Continuity of field seams</td><td>ASTM D5820 air pressure test</td><td rowspan="2">All seams over full length</td></tr>
<tr><td>ASTM D5641 vacuum box test</td></tr>
<tr><td rowspan="2">Weld quality</td><td>Visual observation of a consistent ‘squeeze out’ on the weld edge indicating that the correct temperature and pressure were used during installation</td><td>All fusion welded seams over full length</td></tr>
<tr><td>Visual observation of the weld appearance being smooth, uniform and free of streaks and lumps, in addition to having no obvious scoring, notches or deep scratches introduced by surface grinding</td><td>All extrusion welded seams over full length</td></tr>
</table>
</td></tr>
</table>