Canal Walls – Stage One Yunderup Canals

Background

Stage 1 of the Yunderup Canals was constructed in the mid-1970s. It was one of the first canal estates constructed in Western Australia. The below aerial photograph shows the particular properties contained within stage 1.

The original canal walls in stage 1 of the Yunderup Canals were constructed with asbestos to a height varying between 0.3m to 0.4m AHD. A number of these walls have a crest which is below the current local tidal range. The current local tidal range has been affected since the 1970s due to the impacts of sea level rise and the opening of the Dawesville Cut in the 1990s. This has caused the canal walls in the estate to be regularly overtopped, mostly during higher tides and storm surge events. In the coming 25 to 30 years, the sea level is projected to rise 0.15m along the Western Australian coast. This will cause the canal walls to be overtopped more regularly. Further, many of the original canal walls are deteriorating due to their age. The condition of these canal walls ranges from very poor to good. Some of the original canal walls have already been replaced with plastic sheet piling or other materials and it is apparent

that the remaining original canal walls will need to be replaced in the near to medium future.

This Policy provides requirements for the replacement and modification of canal walls in Yunderup Canals Stage 1. The objectives and requirements of the Policy will ensure new canal walls are constructed to a suitable standard and height, are of a consistent design and are structurally sound within their marine environment.

Application/Definitions

This Policy applies to all properties within Yunderup Canals Stage 1 where an existing canal wall is proposed to be replaced.

A canal wall is a retaining wall constructed in a canal estate to retain land adjacent to the canal frontage.

Planning Approval Requirements

All proposed canal wall replacements and modifications require planning approval of the Shire of Murray. Applicants will need to clearly demonstrate that the proposed canal wall replacement meets the objectives and requirements of this Policy and any other relevant requirements of the Shire's planning framework.

Where there is an inconsistency between this policy and a requirement under a more specific planning framework document for a particular property, the more specific requirement will prevail.

Objectives

To ensure canal walls are replaced to a height that is above the current local tidal range and reduces the frequency of overtopping caused by storm surge and sea level rise.

To ensure canal wall replacements are generally consistent in appearance, do not detract from the visual amenity of the area and are not highly noticeable or obvious in comparison to other canal walls in the vicinity.

To ensure canal wall replacements are structurally sound, tie in appropriately with adjoining canal walls and are designed to prevent water scouring and erosion. In this respect recommended specifications and drawings have been provided with this Policy (Appendix A).

To ensure all asbestos associated with an original canal wall is removed and appropriately disposed of during the replacement of a canal wall.

Requirements

1. The canal wall replacement or modifications shall be constructed of vinyl sheet piling in accordance with the specifications and drawings provided with this Policy. This includes details regarding the supply and installation of the vinyl sheet piling, capping and walers, supply and placement of backfill, supply and placement of appropriate crest protection and the reinstatement of damaged landscaping, paving, wall or other items on adjoining properties.

2. The canal wall replacement shall have a top of wall height of 0.7m AHD.

3. The colour of the vinyl sheet piling is to be clay or grey.

4. The colour of any external timber walers is to be left in its natural state or painted the same colour of the vinyl sheet piling. The colour of any vinyl sheet capping is to be the same colour of the vinyl sheet piling.

5. The canal wall replacement or modifications shall be constructed adjacent to the boundary and entirely within the private lot.

6. Any asbestos associated with a canal wall proposed to be replaced or modified shall be appropriately removed and disposed of in accordance with the applicable statutory requirements, in particular the *Health (Asbestos) Regulations 1992* (as amended).

7. Where the provided specifications and drawings are not proposed to be used, alternative specifications may be considered for approval by the Shire provided that the details are prepared by a Professional Engineer specialising in coastal and marine projects.

Specifications and Drawings for Canal Wall Replacements and Modifications in Yunderup Canals Stage 1

Materials

All materials used in the construction of the canal wall replacement or to modify a canal wall are to be from a recognised manufacturer and be suitable to prevent corrosion in the marine environment with a service life of at least 25 years.

Installation Works

Installation works are to be carried out by a recognised contractor with previous experience with the installation or similar works.

The Retaining Wall System

The retention system is to meet the requirements of the following standards or guidelines:

- Australian Standard 4997-2005 *Guidelines for the design of maritime structures;*
- Australian Standard 2159-2009 *Piling – Design & Installation*
- Development Control Policy 1.8 *Canal estates and artificial waterway developments.*

Vinyl Sheet Piling

The vinyl sheet pile section is to be the SG225. The vinyl sheet piles are to be driven to the lines, levels and dimensions shown on the drawings with a method suitable to achieve the desired penetration depth. A reduced sheet pile penetration depth may be suitable adjacent to slipways where a reduced retained height exists. A reduced vinyl sheet pile penetration depth shall only be constructed adjacent to slipways following design and certification by a Professional Engineer specialising in coastal and marine projects.

The vinyl sheet piles shall be installed to achieve a top of wall height of +0.7m AHD. This shall be to the lines, levels and dimensions shown on the drawings.

The vinyl sheet piles shall be connected to one another to the best recommendations of the manufacturer. Sheet piles shall be connected to permit drainage through the clutches (connections), while preventing loss of backfill material. Corner sections shall be installed with suitable components to the best recommendations to the sheet pile manufacturer.

All sheet piling shall be manufactured entirely from a rigid, high impact, UV-inhibited, weather able vinyl compound. All exposed surfaces of the sheet piling shall be UV resistant, and comprised of virgin material with a minimum ASTM D4216 Cell Classification of 1-42443-33 to ensure reliable performance and colour consistency. If mono-extrusion technology is used, the entire sheet pile must be comprised of virgin material with a minimum ASTM D4216 Cell Classification of 1-42443-33.

The section modulus of the sheet piling shall be no less than 387 cm^3 per lineal meter of wall.

The moment of inertia of the sheet piling shall be no less than 2,458 cm^4 per linear metre of wall.

The sheet piling must have a minimum thickness of 5.7mm.

The sheet piling must have a maximum section depth of 127mm to prevent web buckling.

The sheet piling must have a minimum width of 457mm per sheet resulting in a maximum of 3 interlocks per liner meter of wall. The interlocks of sheet piling shall be free-sliding, provide a swing angle suitable for the intended installation but not less than 5 degrees when interlocked, and maintain continuous interlocking when installed.

All male interlocks must incorporate I-Beam Lock reinforcement to resist lock separation and decrease seepage.

The sheet piling must be clay or grey in colour.

Capping and Walers

Pile capping shall be suitable for the type of vinyl sheet pile used as recommended by the manufacturer. Pile capping attachments shall be constructed of a material suitable to prevent corrosion in the maritime environment for a period of at least 25 years without replacement.

Pile capping shall be installed to the best recommendations of the sheet pile manufacturer. External timber walers shall be constructed of a timber suitable to withstand conditions in the maritime environment over a 25 year period. Waler attachments shall be constructed of a material suitable to prevent corrosion in the marine environment for a period of at least 25 years without replacement. Timber walers shall be installed to the best recommendations of the sheet pile manufacturer.

Tie-ins

The aim of the tie-ins (or returns) is to prevent scour at the intersection of differing ground levels within the lot or with adjacent lots. All new sheet pile walls shall be suitably tied-in to prevent scour of both the landowner's land and any adjacent landowners' land.

Tie-in details will need to be determined on a case by case basis as a range of existing wall layouts and levels exist in the Yunderup Stage 1 canals. The drawings show two possible canal wall layouts with appropriate tie-in details. The landowner shall prepare a detailed site plan for assessment depicting the extent of the proposed works, wall alignment and tie-in details prior to construction. If differing levels exist at the lot boundary following the new sheet pile wall construction the wall alignment shall be continued landward to tie these levels together and prevent scour.

Fences, landscaping and paving on any adjacent lots shall be reinstated by the landowner constructing the new sheet pile wall following completion of construction. If a jetty exists, the jetty and the jetty abutment are to tie-in with the upgraded sheet pile works in a way that prevents scour potential in front or behind the wall.

Backfill

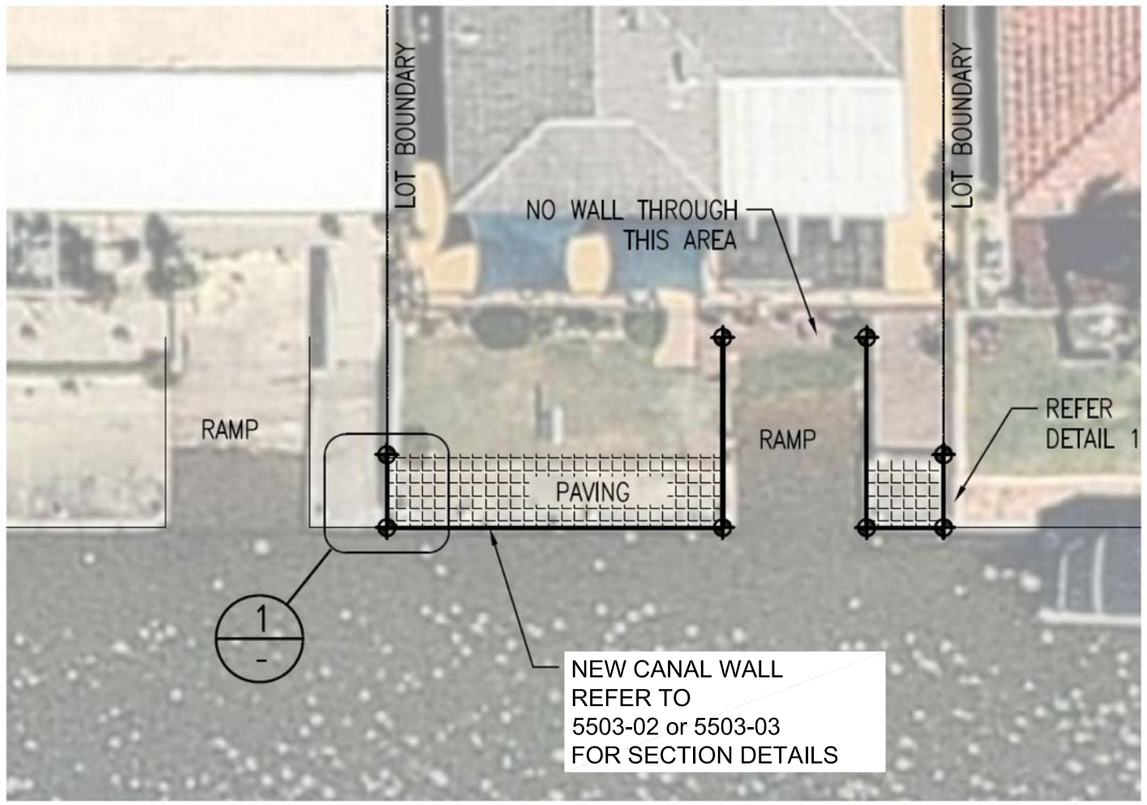
Backfill material shall consist of a free draining gravel or soil and shall be free from clay lumps and excess organic matter or other foreign material. The backfill material shall be compacted to a level suitable for the intended paving.

Paving

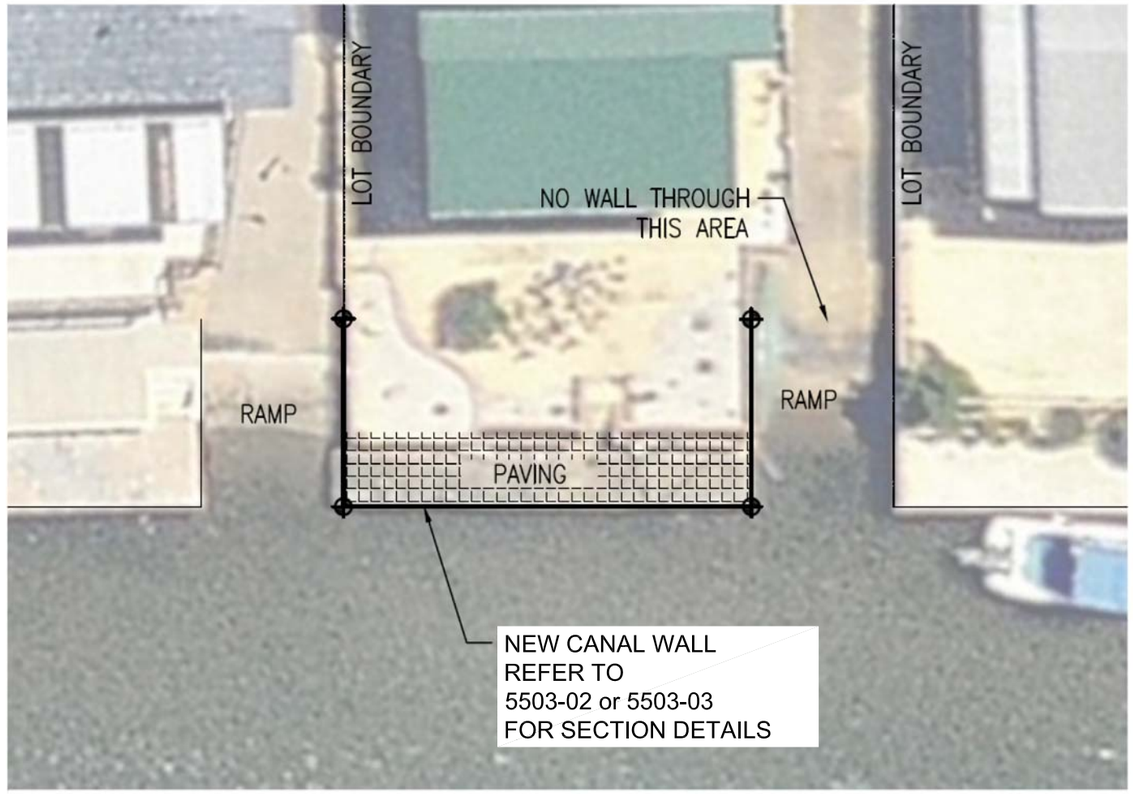
The crest of the new sheet piles is likely to be overtopped during high water level events. The area behind the new sheet pile wall shall be appropriately paved to prevent the loss of backfill material behind the sheet pile wall. This area may be paved using concrete, bricks or other method that prevents the loss of backfill material during inundation events.

Depending on the type of paving used, a geotextile filter may need to be placed underneath to prevent loss of fines.

A minimum lower terrace width of 2m is allowed with the new sheet pile wall, as shown on the drawings. A reduced lower terrace width may be accepted following design and certification by a professional engineer specialising in coastal and marine projects.



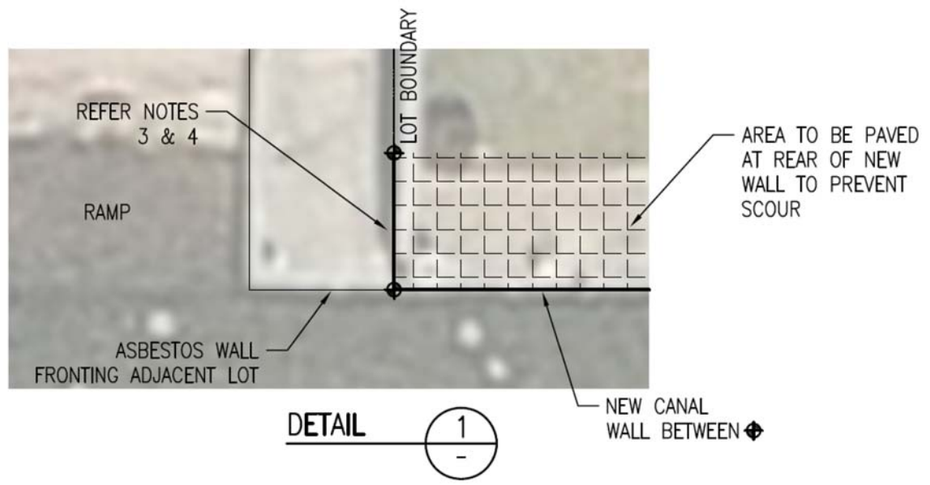
TYPE 1 TYPICAL CANAL WALL LAYOUT



TYPE 2 TYPICAL CANAL WALL LAYOUT

General Notes:

1. Wall alignment and position to be constructed in accordance with the Shire's requirements set out in the relevant local planning policy.
2. A wide range of wall layouts, crest treatments and terracing exist in stage 1. Final wall replacement must be tailored to prevent scour and to provide appropriate tie-ins with terracing and adjacent lot owner's walls.
3. In general continue new canal wall landward at lot boundary if different levels exist at lot boundary. If adjacent wall has been upgraded to this specification then new wall is to tie in with adjacent wall. All tie in works shall be completed to prevent scour.
4. Fences, landscaping and paving on adjacent lot to be re-instated by the landowner upgrading the canal wall following works.
5. Jetties and jetty abutments are to tie in with the upgraded sheet pile works in a way that prevents scour potential in front or behind wall.
6. Refer to design notes on drawing 5503-02 or 5503-03.



PRELIMINARY - NOT FOR CONSTRUCTION - TYPICAL ONLY

REV	DESCRIPTION	BY	DATE
01	Note 6	CW	07-04-16

JSTEEL Australasia
Level 23, 207 Kent Street
Sydney, NSW, 2000
T: +61 2 8198 9500
E: contact@jsteel.com.au
W: www.jsteel.com.au

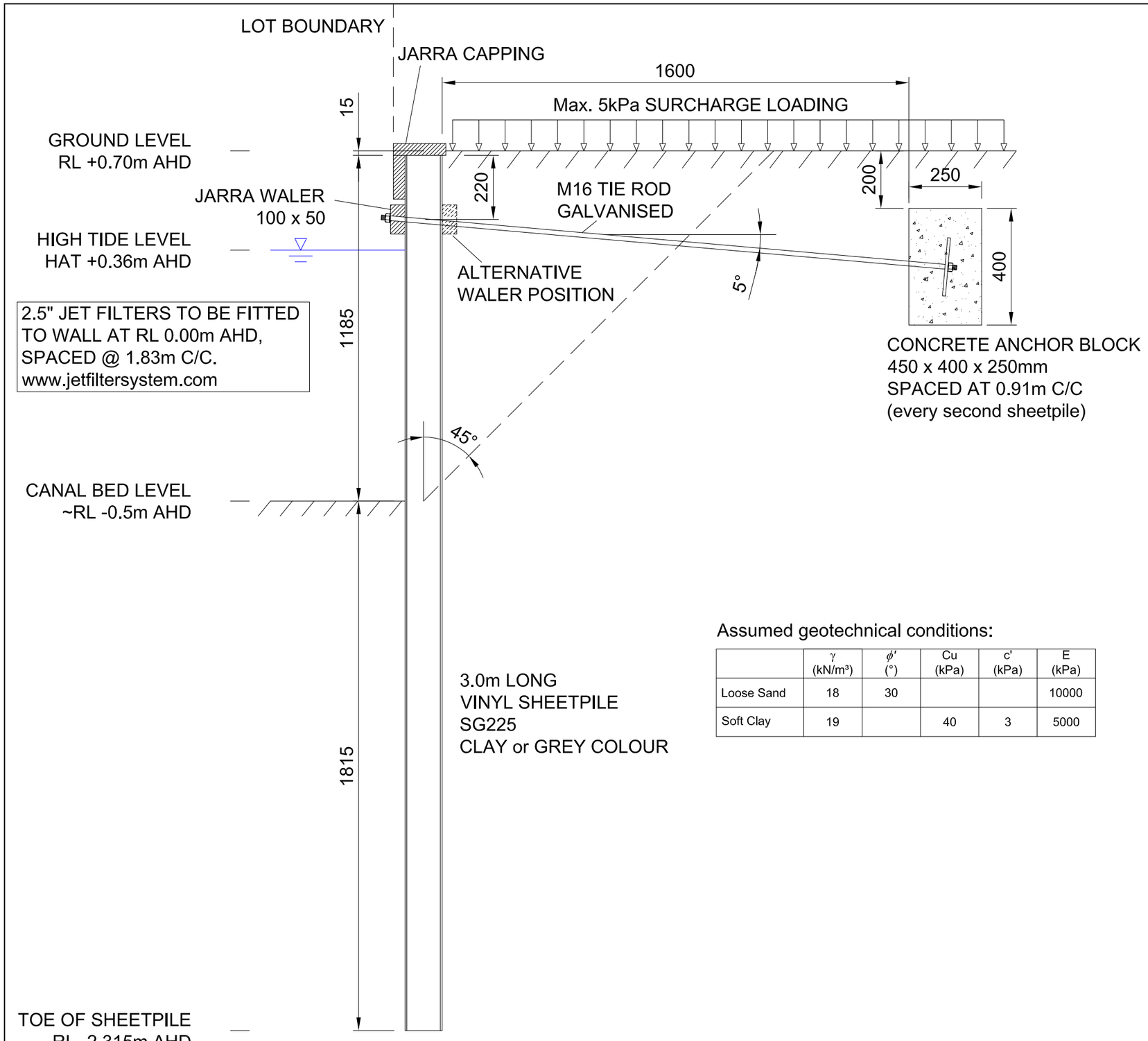
CLIENT: SHIRE OF MURRAY

PROJECT TITLE: YUNDERUP CANALS STAGE 1 CANAL WALL REPLACEMENT

DRAWING TITLE: LAYOUT PLAN

DESIGNED	DRAWN	CHECKED	APPROVED
CW	CW	XX	XX
24-03-16	24-03-16	XX-XX-XX	XX-XX-XX

EQ No.	DWG No.	STATUS	REV No.
5503	01	P	1



Assumed geotechnical conditions:

	γ (kN/m³)	ϕ′ (°)	Cu (kPa)	c' (kPa)	E (kPa)
Loose Sand	18	30			10000
Soft Clay	19		40	3	5000

General Notes:

1. All dimensions are in millimetres unless otherwise specified.
2. All Reduced Level's (RL's) are in metres related to Australian Height Datum unless otherwise specified.
3. These drawings shall be read in conjunction with all other survey drawings, existing service drawings, service diversion drawings, and Dial Before You Dig drawings.
4. The contractor shall ensure a services search has been carried out, and that all existing structures, services (including redundant services) and utilities are located prior to commencement of works.
5. The contractor is to implement protection and avoidance measures to ensure no damage occurs in the process of carrying out the works.
6. Any discrepancies or non-compliance with the design drawings are to be referred to J Steel Australasia (JSA) for clarification.
7. All materials, workmanship and tolerances shall be in accordance with Australian Standards, except where modified by these drawings. The applicable standards shall be the referenced standards current at date of drawing issue.
8. Boat loads and or jetty loads not included in wall design.
9. Wall design valid for private & restricted residential properties only.

Sheetpiles:

10. All sheetpiles are to be SG225 Vinyl sheetpiles. Colour 'Clay' or 'Grey'.
11. Piles to be installed in accordance with the procedures and requirements of AS2159:2009 Piling - Design and installation.
12. The design has been based on the assumed ground conditions indicated on the drawing. If ground conditions differ the design shall be reviewed.
13. JSA shall be notified if for any reason the piles cannot by installed to the required design depth.
12. Ground levels and pile embedments shall be strictly in accordance with those shown on these drawings. No other filling/excavation is allowed without JSA design review. Over-excavation/scour has not been considered.
13. The construction surcharge loadings allowed for in the design are shown on the drawings. No construction/building to occur within 2.0m of the wall face. These are not to be exceed at any time without approval from JSA.
14. A design life of 25 years has been adopted.
15. Pre-boring of piles is not permitted without prior written approval from JSA.
16. All sheetpiles shall be fully clutched to adjacent sheets over their entire length.
17. Do not use damaged sheetpiles. Remove and replace if damaged during installation.
18. Piling records are to be obtained in accordance with AS2159:2009.

Structural Steel & Fabrication:

19. All structural steel, fabrication and erection to be in accordance with AS4100:1998.
20. All plate to be to AS3678 grade 300.
21. All tie bar to have minimum yield strength of 350N/mm².
22. All nuts are to be grade 8 with washer.
23. All galvaising to have minimum thickness of 85micron.

Structural Concrete:

24. All materials and workmanship shall be in accordance with AS3600:2009.
25. Sulphate resistant concrete to be used at all times.
26. All concrete to be minimum f'c = 50 MPa marine grade, 80mm slump and 20mm aggregate size.

PRELIMINARY - NOT FOR CONSTRUCTION - TYPICAL ONLY

REV	DESCRIPTION	BY	DATE
1	Note 10 & Scour protection	CW	07-04-16

J STEEL Australasia
Level 23, 207 Kent Street
Sydney, NSW, 2000
T: +61 2 8198 9500
E: contact@jsteel.com.au
W: www.jsteel.com.au

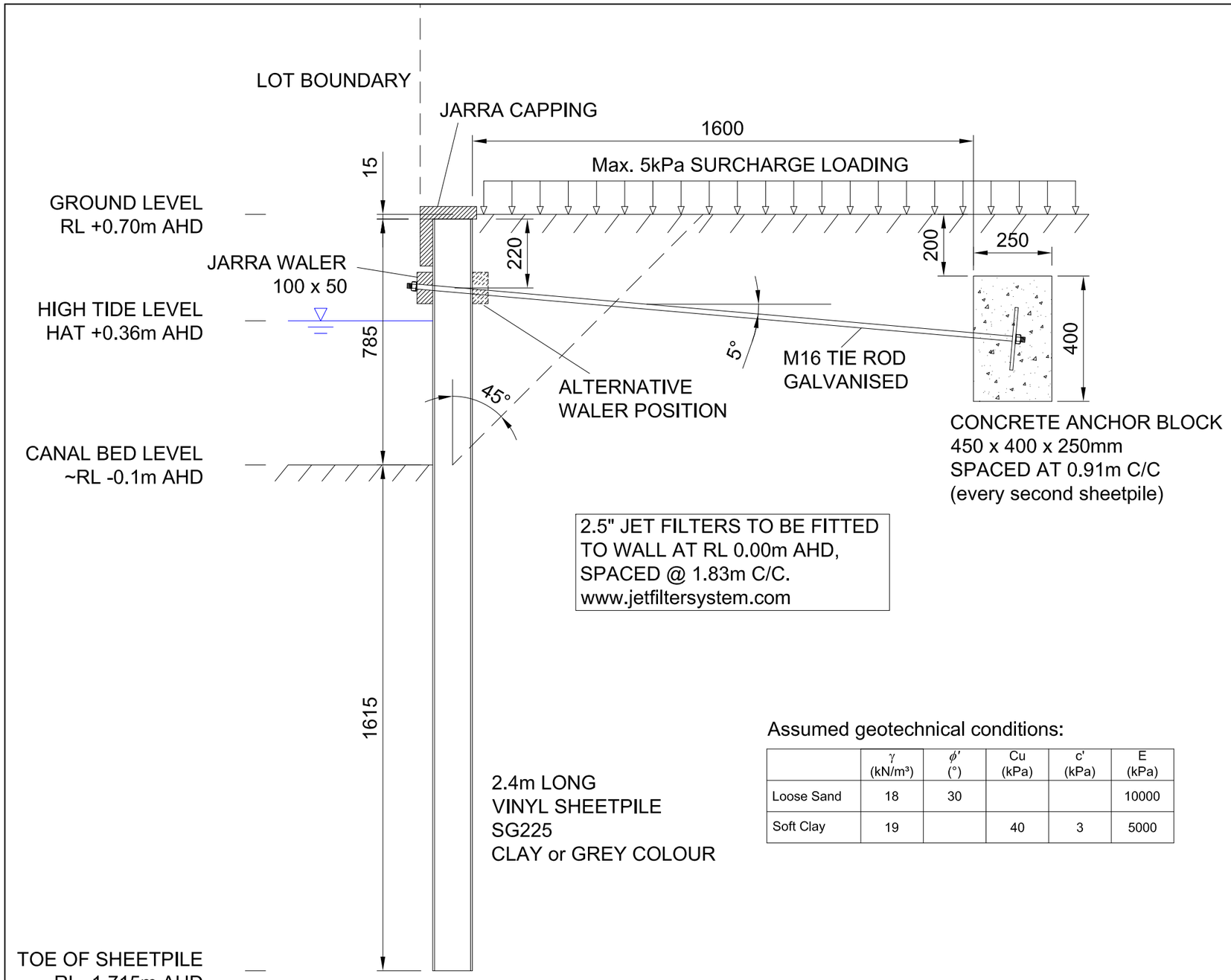
CLIENT: SHIRE OF MURRAY

PROJECT TITLE: YUNDERUP CANALS STAGE 1 CANAL WALL REPLACEMENT

DRAWING TITLE: TYPICAL SHEETPILE SECTION 1.2m RETAINED HEIGHT

DESIGNED	DRAWN	CHECKED	APPROVED
CW	CW	XX	XX
24-03-16	24-03-16	XX-XX-XX	XX-XX-XX

EQ No.	DWG No.	STATUS	REV No.
5503	02	P	1



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CLIENT: SHIRE OF MURRAY

PROJECT TITLE: YUNDERUP CANALS STAGE 1 CANAL WALL REPLACEMENT

DRAWING TITLE: TYPICAL SHEETPILE SECTION 0.8m RETAINED HEIGHT

DESIGNED	DRAWN	CHECKED	APPROVED
CW	CW	XX	XX
24-03-16	24-03-16	XX-XX-XX	XX-XX-XX

EQ No.	DWG No.	STATUS	REV No.
5503	03	P	1