



BEST PRACTICE GUIDE

VERSION # 1 – APRIL 2013

RIVER EROSION REPAIR

Details contained in this document have been prepared to offer assistance to GWRC staff and Contractors.

The techniques and plans contained in this Guide have been prepared and included on the basis of the information accumulated by GWRC and the experience of GWRC staff over many years in undertaking and supervising repair work. This is made available to offer assistance to rural landowners who experience erosion and are considering whether or not to undertake repairs. The guidelines and plans have been compiled to deal with common or standard situations. Landowners are cautioned against using the guidelines and plans in circumstances which may not be common or standard and are advised to seek professional assistance if in doubt or where there has been significant erosion. While GWRC has endeavoured to ensure the guidelines and plans are a fair statement of the best practice derived from experience, it cannot assume responsibility to any third party for the reliability, accuracy or completeness of the information or plans contained in this Guide or of the applicability of either to any particular circumstances.

In areas of significant erosion, detailed engineering investigation / design may be required.

COVER SHEET

Drawings included within :

- Staggered Concrete Blocks with Rail Iron Anchors & Inter-planted with Willows
Dwg Ref :RL-5317/12
- Rail Iron Debris Fence
Dwg Ref :RL-5317/13
- Rail Iron Debris Fence with Rock Head
Dwg Ref :RL-5317/14 to RL-5317/16
- Permeable Groyne
Dwg Ref :RL-5317/17
- Rock Groyne (160, 350, 500 & 650 Tonne)
Dwg Ref :RL-5317/18 to RL-5317/22
- Concrete Block (Core) Groyne
Dwg Ref :RL-5317/23
- Rock Lining
Dwg Ref :RL-5317/24
- Rock Lining with Varied Batter
Dwg Ref :RL-5317/25
- Gabion & Groyne Barb
Dwg Ref :RL-5317/26 to RL-5317/28
- Rock Rip Rap Grading Envelope
(Dwg Ref :RL-5317/29)
- GWRC Survey Mark Installation
Dwg Ref :RL-5317/30 & /31
- Typical Concrete Block Cabling Detail
Dwg Ref :RL-5317/32

For latest version guide, contact Greater Wellington Regional Council Flood Protection Department

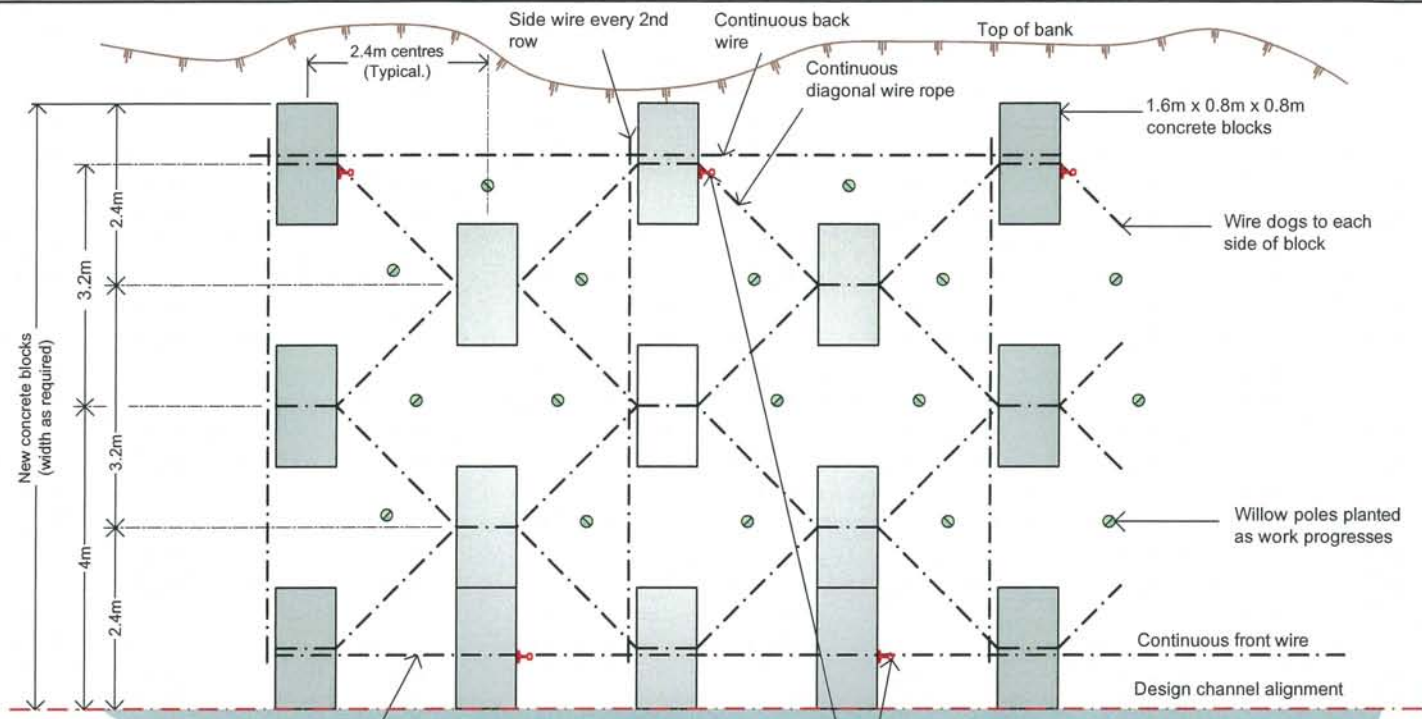
For more information, contact Greater Wellington:

PO Box 11646
Manners Street
Wellington, 6141

T 04 384 5708
F 04 385 6960

April 2013
File NI/50/03/07 v1
e-doc #1178292

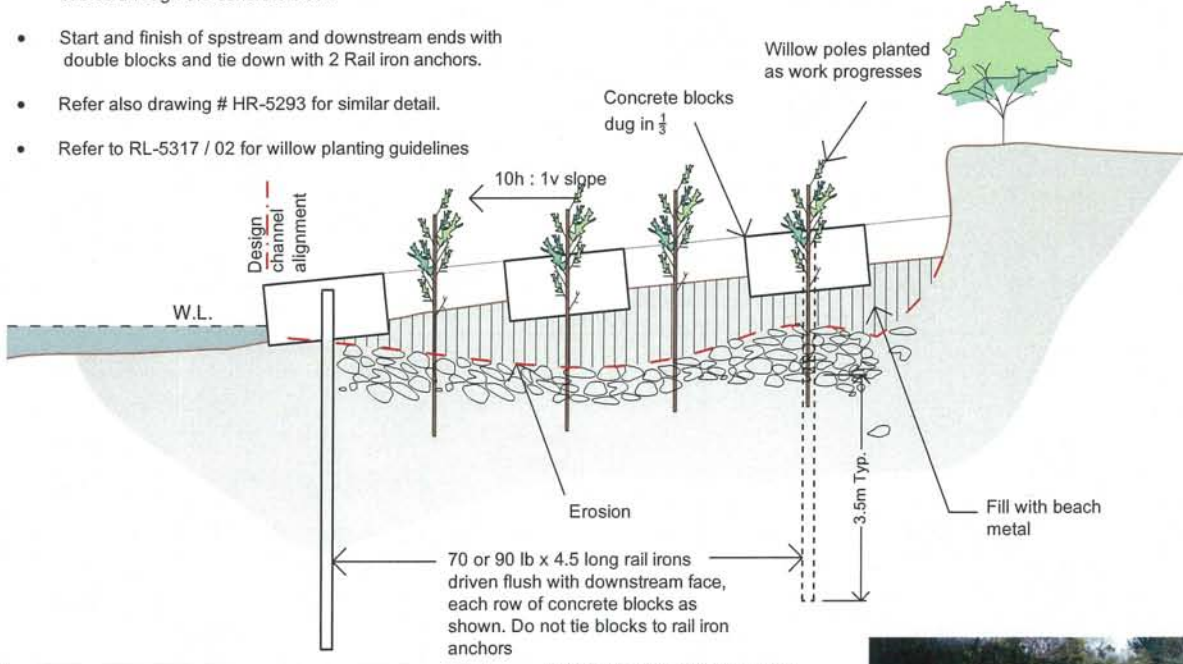
www.gw.govt.nz
info@gw.govt.nz



NOTE :
 Heavy duty wire cable. Blow holes in rail after driving so cable can be threaded through.

- Cable size depends on concrete block hole size. Allow for 2 cables through the concrete block.
- Start and finish of spstream and downstream ends with double blocks and tie down with 2 Rail iron anchors.
- Refer also drawing # HR-5293 for similar detail.
- Refer to RL-5317 / 02 for willow planting guidelines

Flow →
PLAN
 Scale 1 : 100
 70 or 90 lb x 4.5 long rail irons driven flush with downstream face, each row of concrete blocks as shown. Do not tie blocks to rail iron anchors



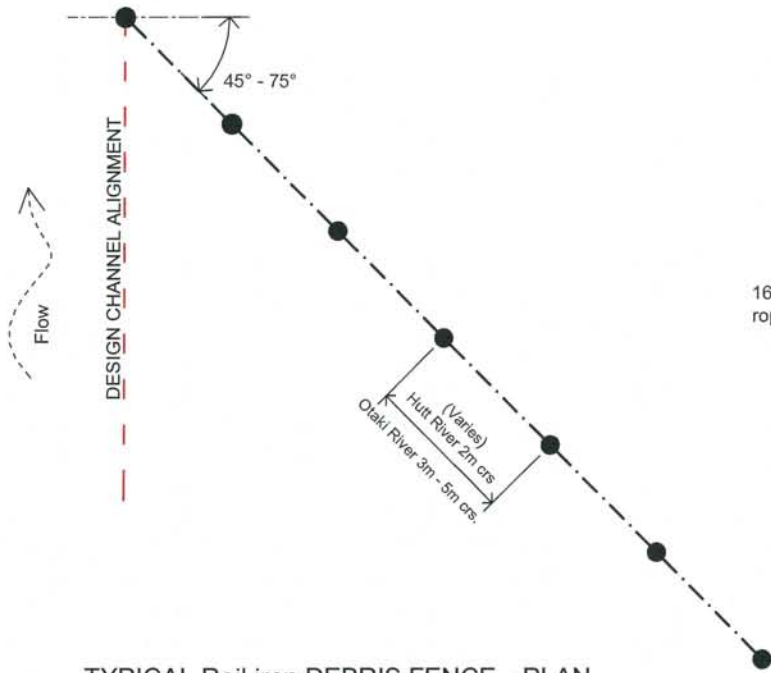
TYPICAL CROSS SECTION
 N.T.S.



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 See also caution on cover sheet.

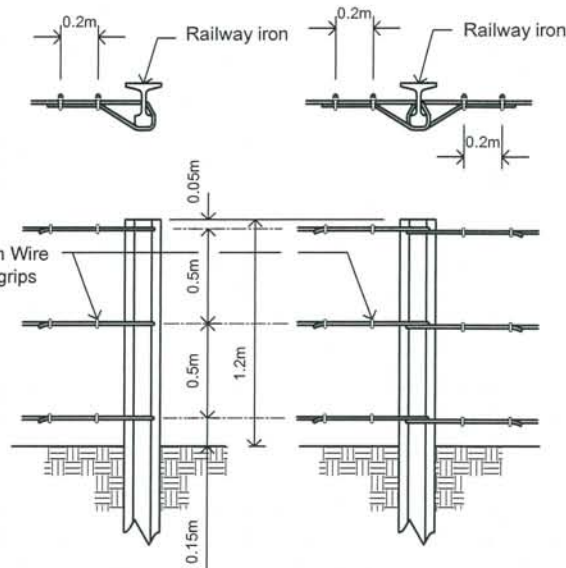
VERSION #	1

DESIGN	COMPILED	April 2013
DRAWN	P. COOK	April 2013
CHECKED	C. C. MUMFORD	3/5/13
APPROVED		6/5/13
Drawing No. RL-5317 / 12		
FILE N/50/2/6	Cad: RL-5317_C.dwg	



TYPICAL Rail iron DEBRIS FENCE - PLAN

Scale 1 : 200

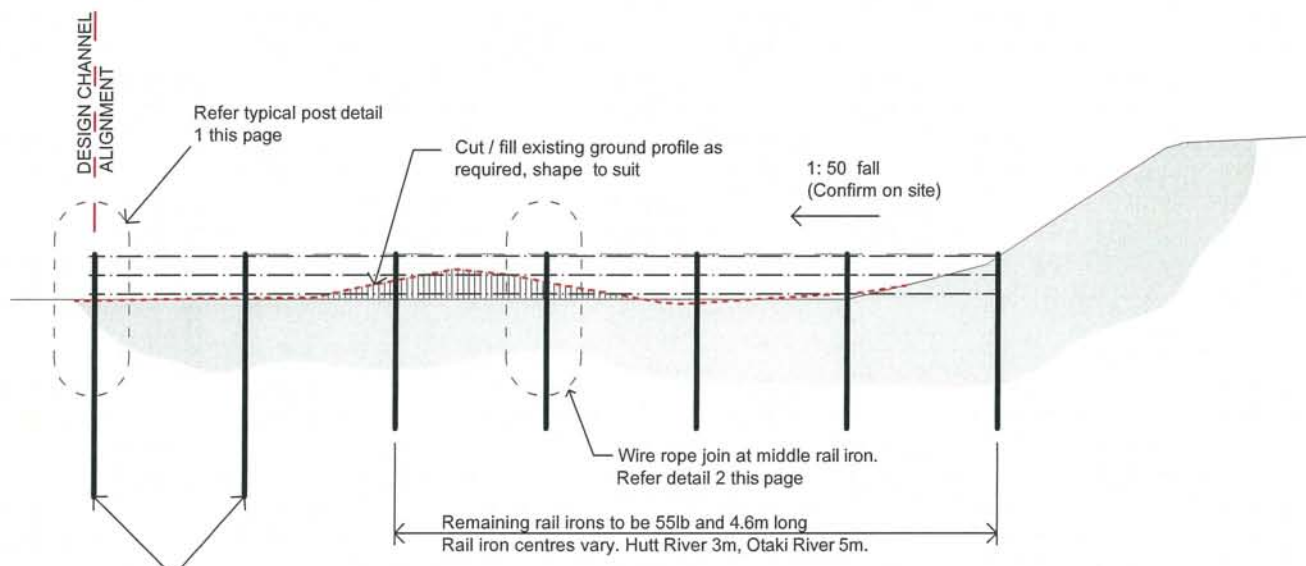


DETAIL 1

Scale 1 : 40

DETAIL 2

Scale 1 : 40



Front 2 rail irons to be 70lb or 90lb and 6.4m long @ 3m centres.

TYPICAL Rail iron DEBRIS FENCE - ELEVATION

Scale 1 : 200

NOTE :

- Debris fence with rock groyne generally placed every second fence. Length & spacing varies as site specific design is required. Typical spacings used in the following areas are :

- Hutt River : Sladden Park 25m crs
- : Moonshine 33m crs
- : Manor Park 30m crs (Includes rock heads)
- : Avalon 30m crs (Includes rock heads)

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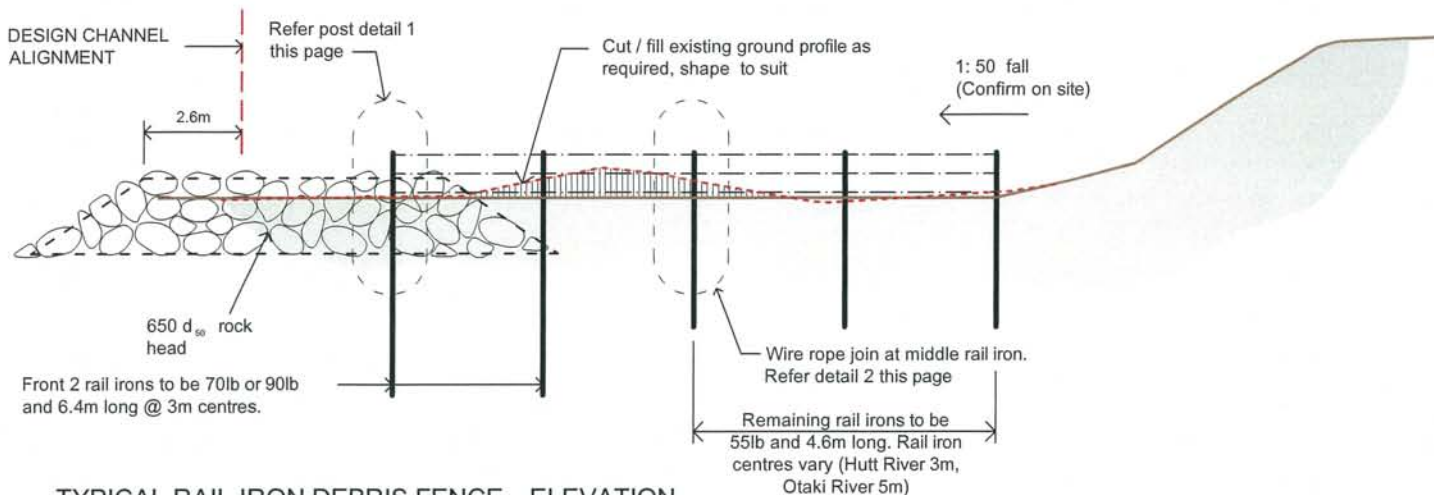
See also caution on cover sheet.

VERSION #	1

EROSION REPAIR

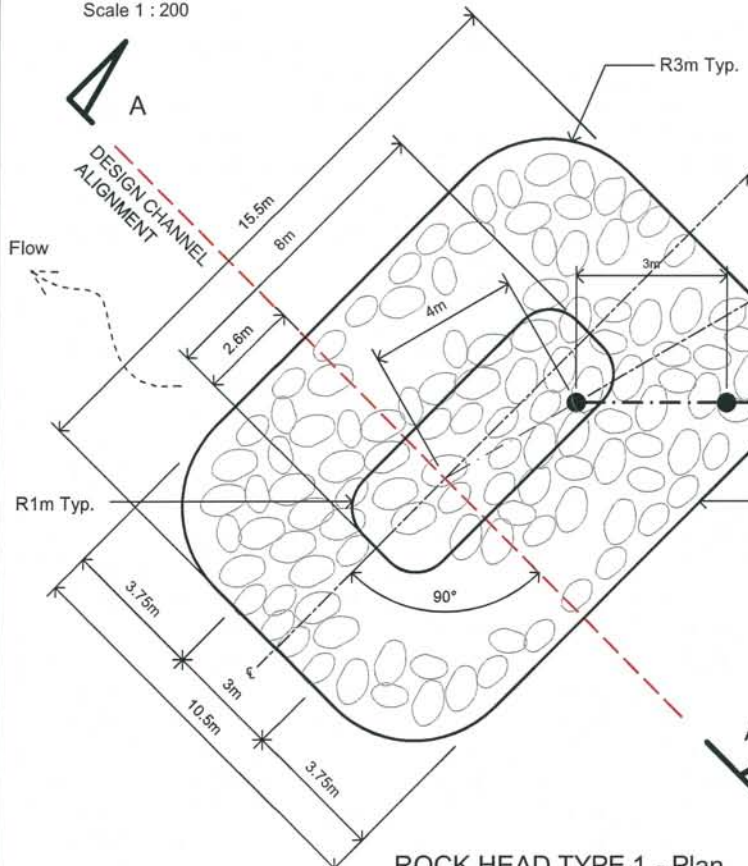
RIVER
STANDARD DETAIL
Rail iron DEBRIS FENCE

DESIGN	COMPILED	April 2013
DRAWN	P.COOK	April 2013
CHECKED	C.C. MUMM	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No. RL-5317 / 13		
FILE N/50/2/6	Cad: RL-5317_C.dwg	



TYPICAL RAIL IRON DEBRIS FENCE - ELEVATION

Scale 1 : 200



ROCK HEAD TYPE 1 - Plan

Scale 1 : 200

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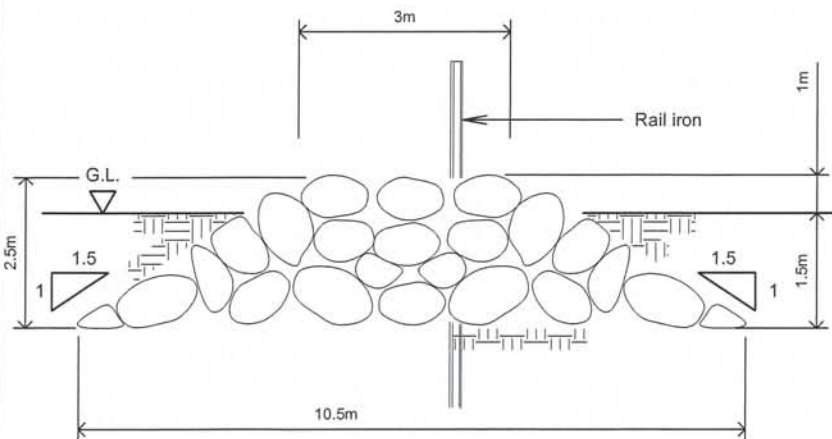
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See also caution on cover sheet.

NOTE :

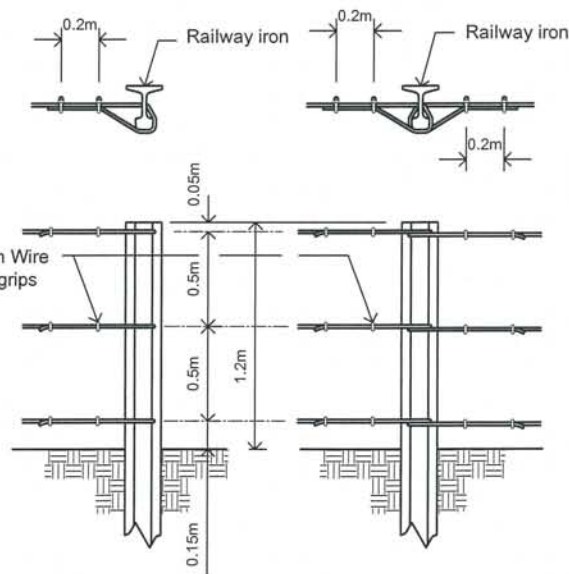
- 1. Debris fence with rock groyne generally placed every second fence. Length & spacing varies as site specific design is required. Typical spacings used in the following areas are :

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- : Avalon 30m crs (Includes rock heads)



ROCK HEAD TYPE 2 - Section A - A

Scale 1 : 200



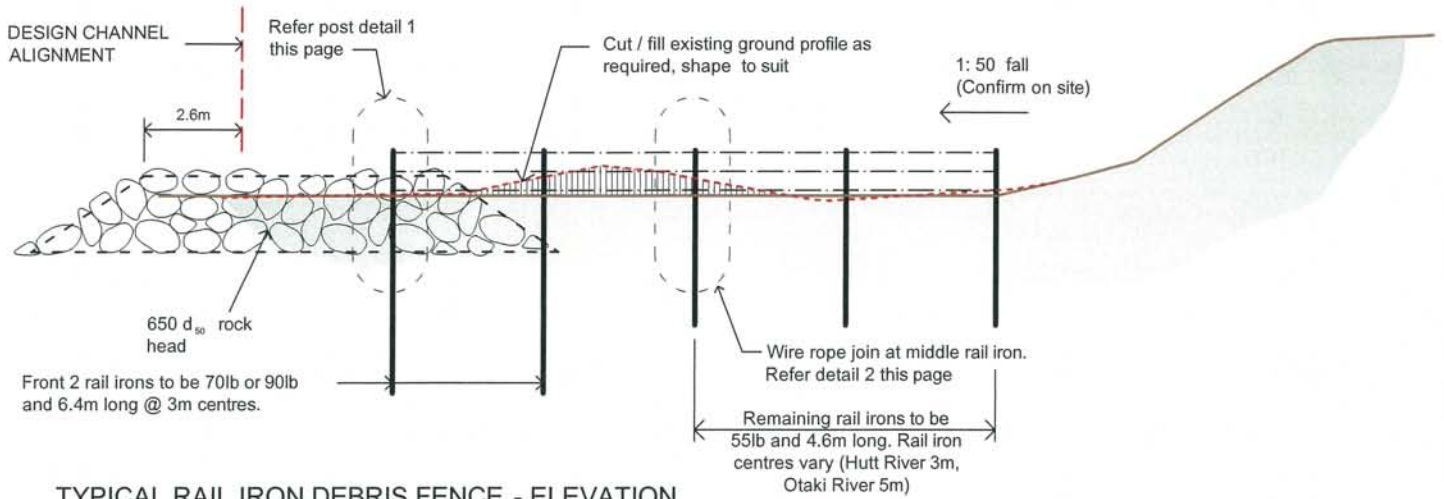
VERSION #
1

EROSION REPAIR

RIVER STANDARD DETAIL

Rail iron DEBRIS FENCE WITH ROCK HEAD (TYPE 1 OF 3)

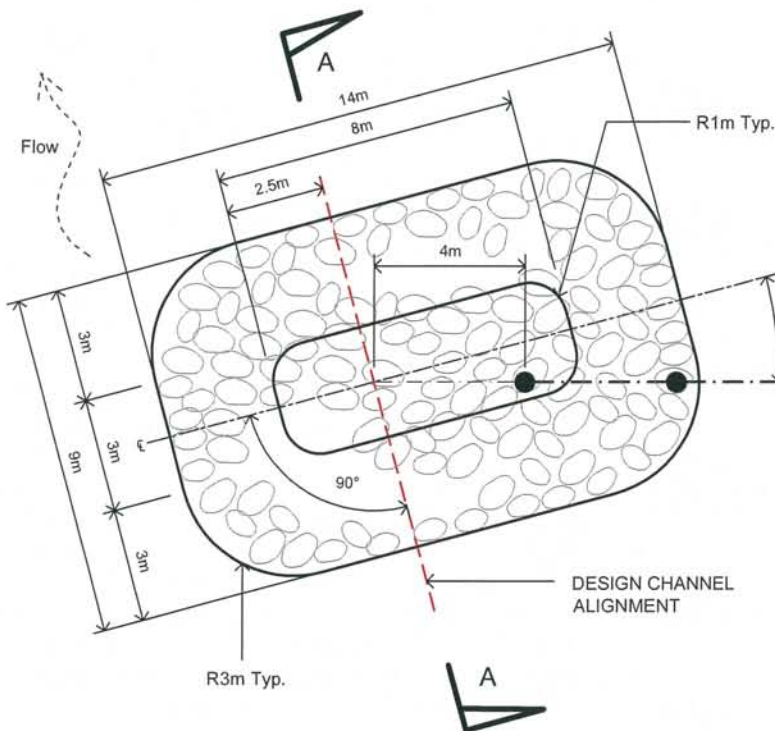
DESIGN	COMPILED	April 2013
DRAWN	P.COOK	April 2013
CHECKED	C.C.MUNN	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No.	RL-5317 / 14	
FILE N/50/2/6	Cad:	RL-5317_C.dwg



TYPICAL RAIL IRON DEBRIS FENCE - ELEVATION

Scale 1 : 200

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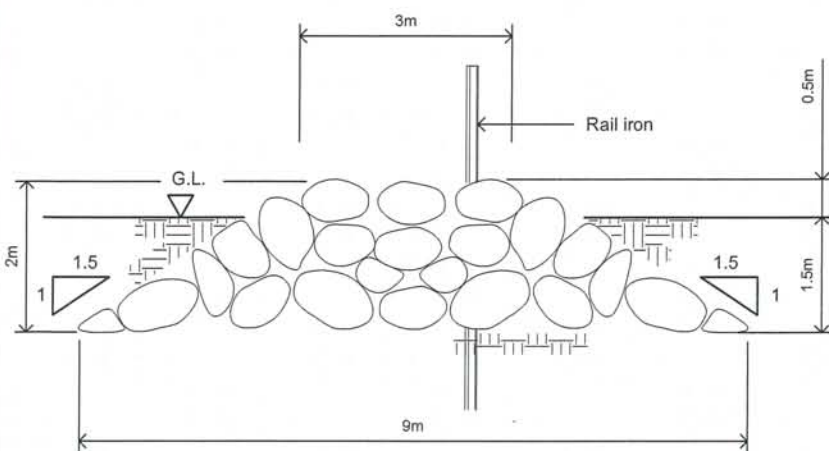


ROCK HEAD TYPE 2 - Plan

Scale 1 : 200

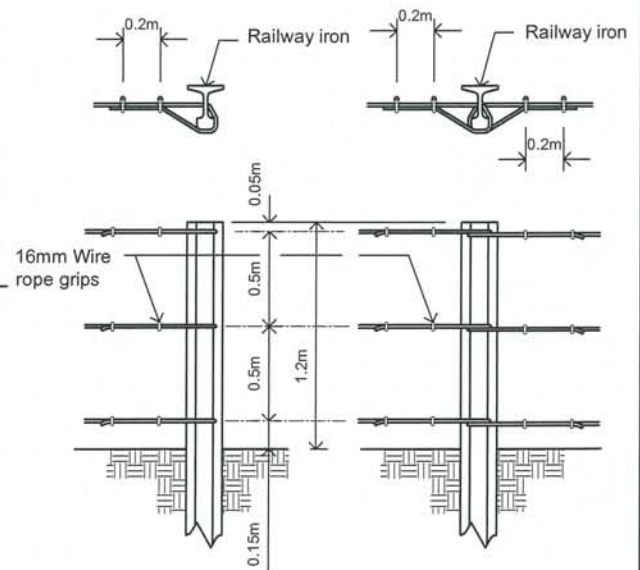
NOTE :
 1. Debris fence with rock groyne generally placed every second fence.
 Length & spacing varies as site specific design is required.
 Typical spacings used in the following areas are :

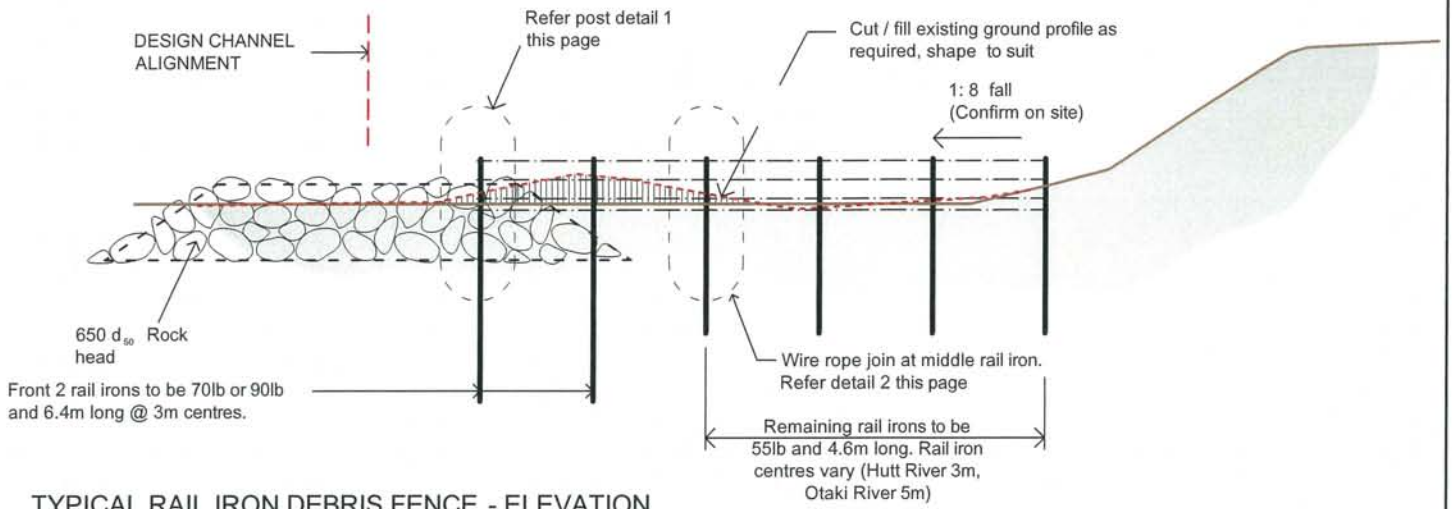
- Hutt River : Sladden Park 25m crs
- : Moonshine 33m crs
- : Manor Park 30m crs (Includes rock heads)
- : Avalon 30m crs (Includes rock heads)



ROCK HEAD TYPE 1 - Section A - A

Scale 1 : 200





TYPICAL RAIL IRON DEBRIS FENCE - ELEVATION

Scale 1 : 200

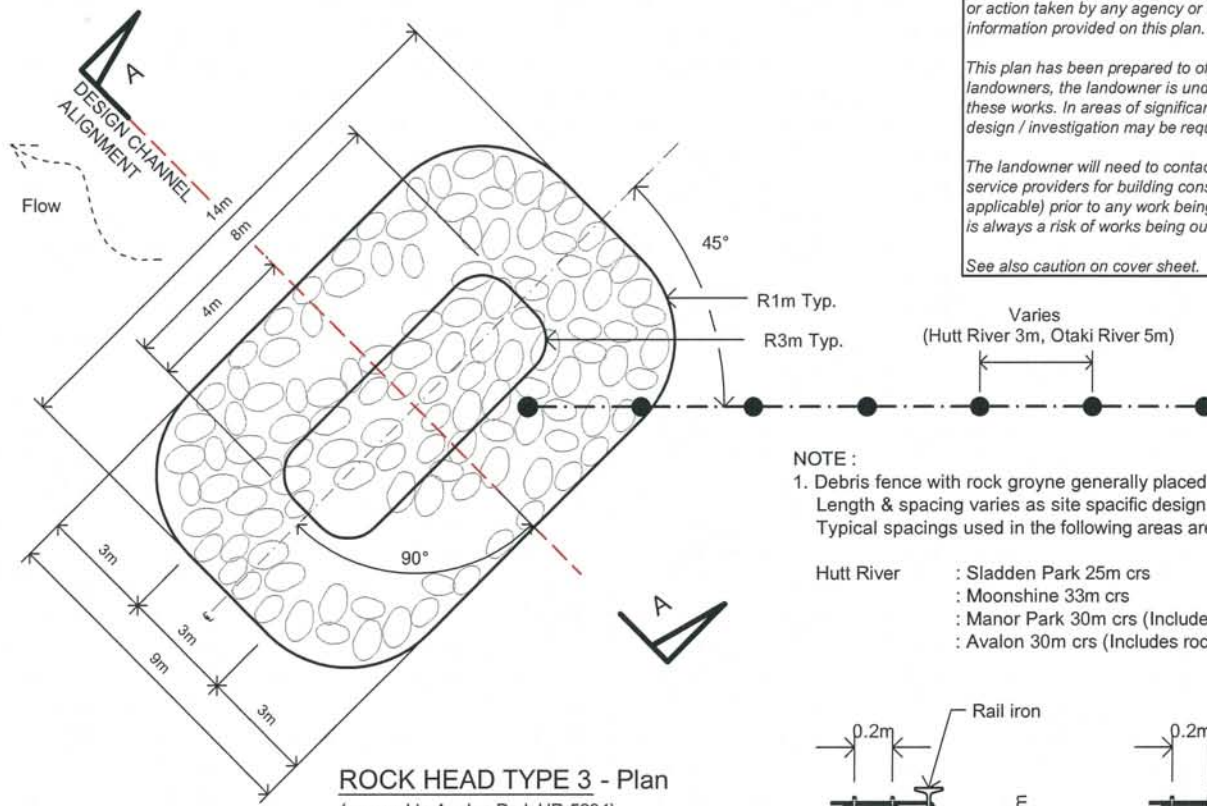
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ROCK HEAD TYPE 3 - Plan

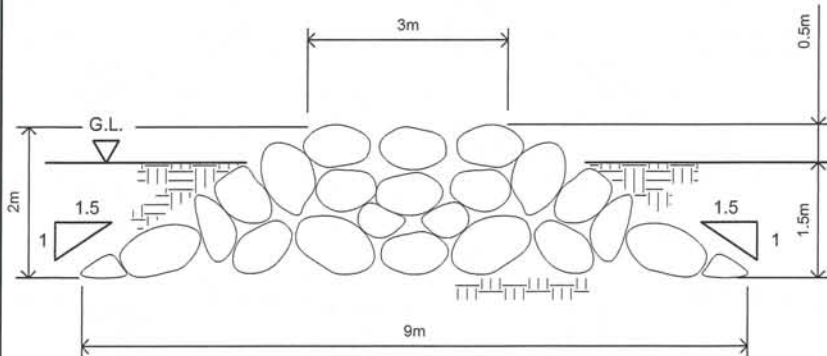
(as used in Avalon Park HR-5234)

Scale 1 : 200

NOTE :

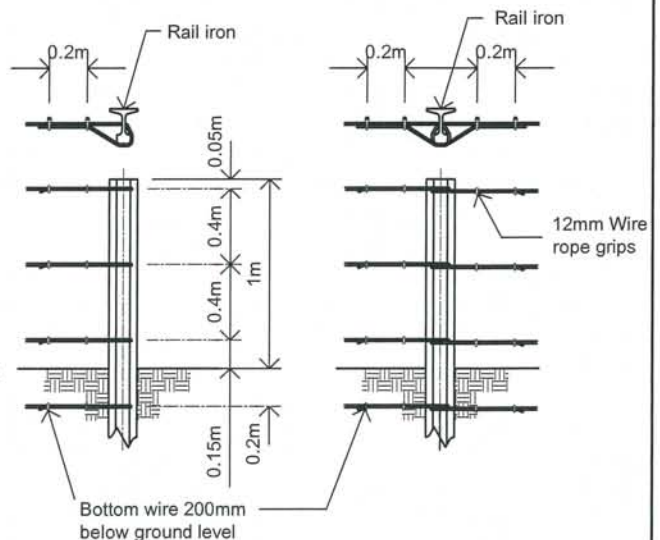
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- : Moonshine 33m crs
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- : Avalon 30m crs (Includes rock heads)



ROCK HEAD TYPE 3 - Section A - A

Scale 1 : 200



DETAIL 1

Scale 1 : 40

DETAIL 2

Scale 1 : 40



VERSION #
1

EROSION REPAIR

RIVER
STANDARD DETAIL
RAIL IRON DEBRIS FENCE WITH ROCK HEAD (TYPE 3 OF 3)

DESIGN	COMPILED	April 2013
DRAWN	P. COOK	April 2013
CHECKED	CC MUIR	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No.	RL-5317 / 16	
FILE N/50/2/6	Cad:	RL-5317_C.dwg

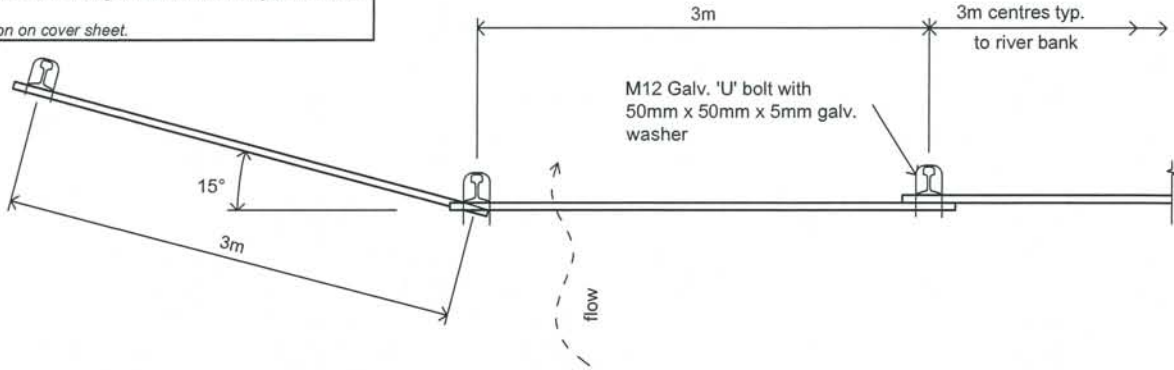
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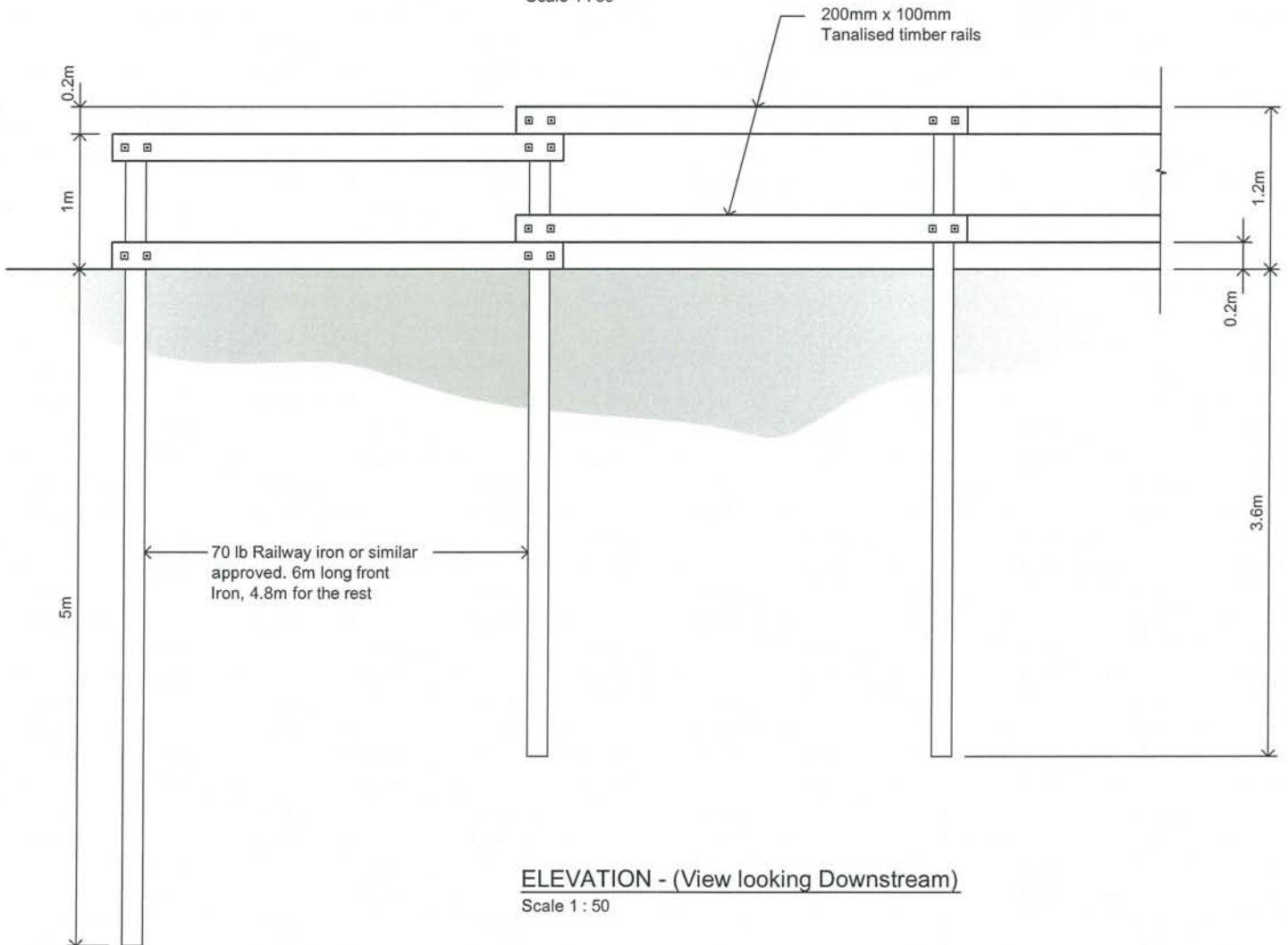
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See also caution on cover sheet.



PLAN
Scale 1 : 50



ELEVATION - (View looking Downstream)
Scale 1 : 50

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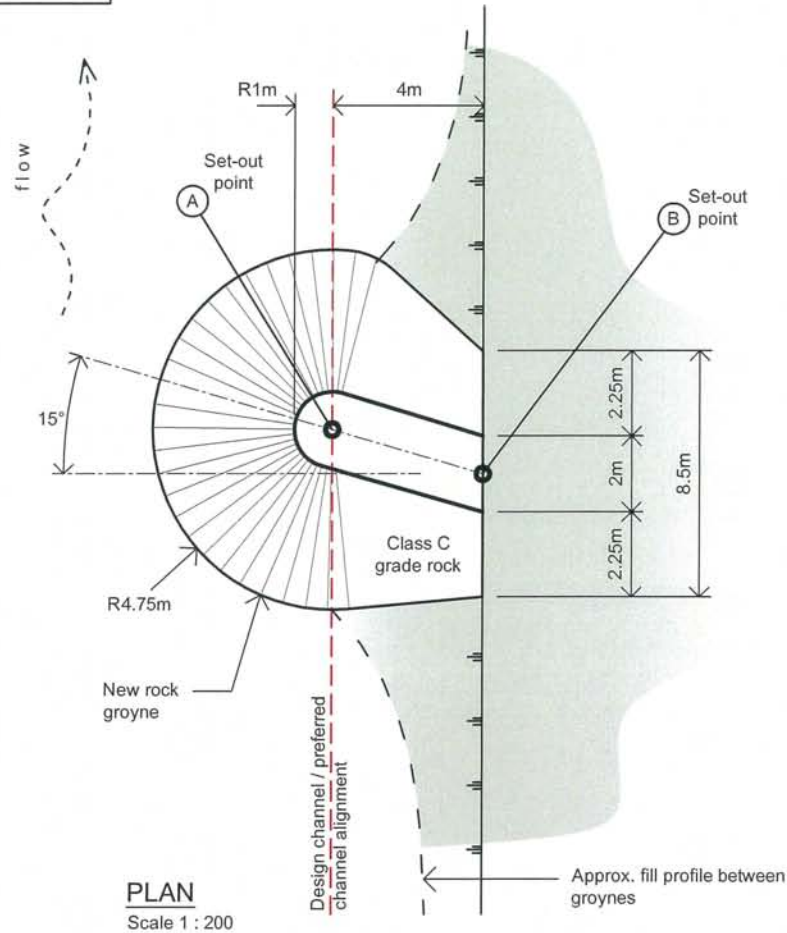
See also caution on cover sheet.

NOTE :

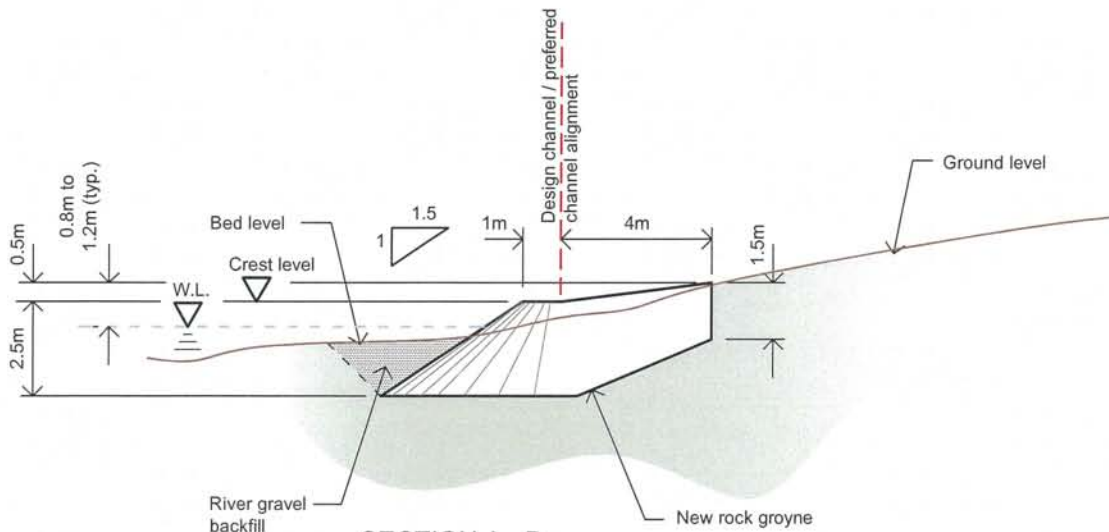
Groyne spacing is a judgment call depending on factors such as tightness of the bend, stream gradient and bank material etc. A general rule of thumb is : Groyne spacing = 1.5 x the distance between Erosion face and preferred channel alignment.

Typical groyne spacings that have been used are :

- Hutt River : Nash Street 60m crs
- : Belmont 70m crs
- : Bridge road 50m crs
- : Ava - Ewen 78m crs
- Waikanae River : 45 - 70m crs (generally on bends)
- Otaki River : 50m crs



PLAN
Scale 1 : 200



SECTION A - B
Scale 1 : 200



VERSION #	1

EROSION REPAIR
RIVER
STANDARD DETAIL
ROCK GROUYNE (160 TONNE)

DESIGN	COMPILED	April 2013
DRAWN	P.COOK	April 2013
CHECKED	CCMUN	3/5/13
APPROVED	RCM	6/5/13
Drawing No.	RL-5317 / 18	
FILE N/50/2/6	Cad: RL-5317_C.dwg	

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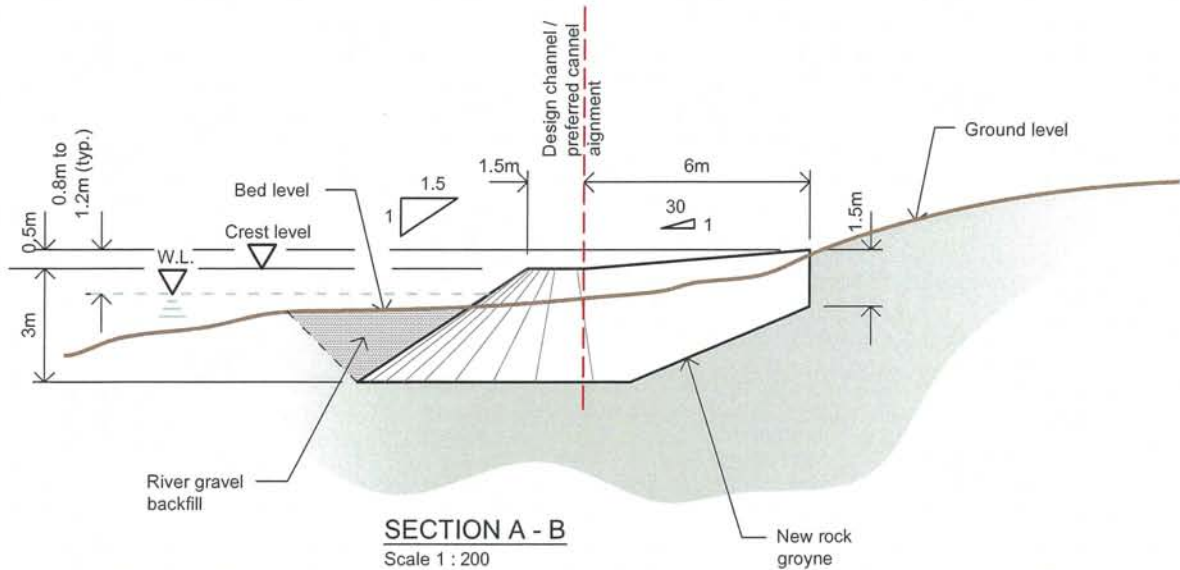
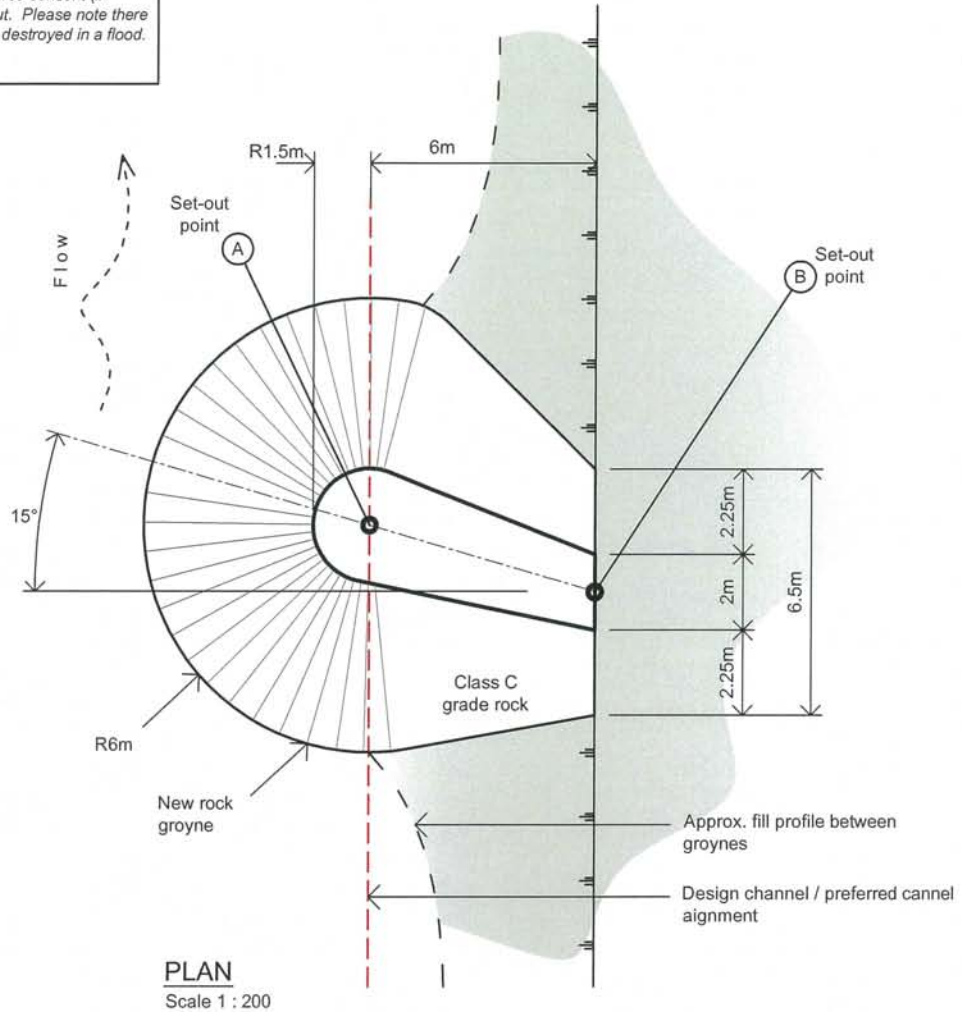
See also caution on cover sheet.

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- Otaki River : 50m crs



VERSION #	1

EROSION REPAIR
RIVER
STANDARD DETAIL
ROCK GROUYNE (350 TONNE)

DESIGN	COMPILED	April 2013
DRAWN	P. COOK	April 2013
CHECKED	C. C. MURRAY	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No. RL-5317 / 19		
FILE N/50/2/6	Cod: RL-5317_C.dwg	

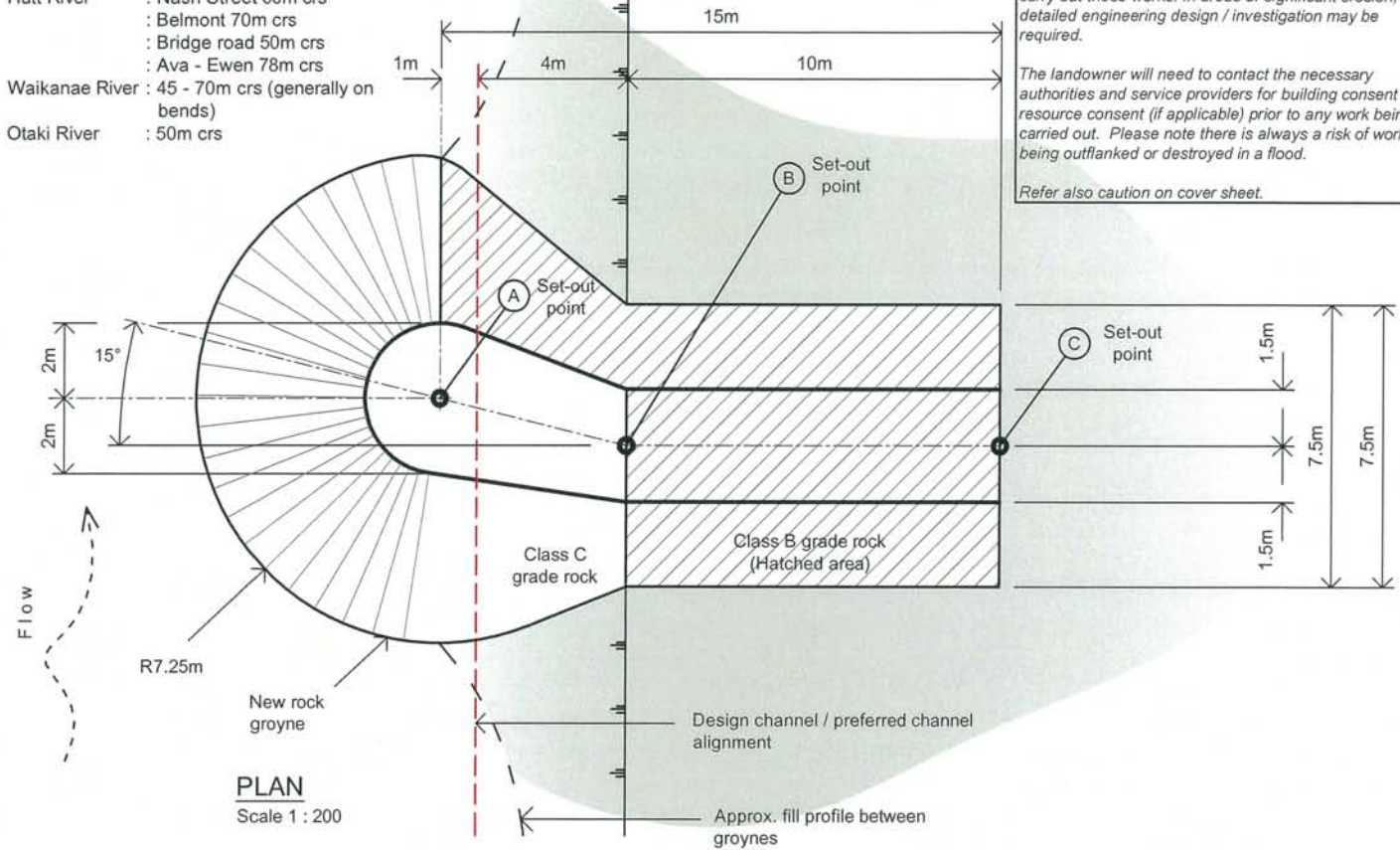
NOTE :
 1. Refer to RL-5317 / 02 for willow planting guidelines

2. Groyne spacing is a judgment call depending on factors such as tightness of the bend, stream gradient and bank material etc. A general rule of thumb is : Groyne spacing = 1.5 x the distance between erosion face and preferred channel alignment.

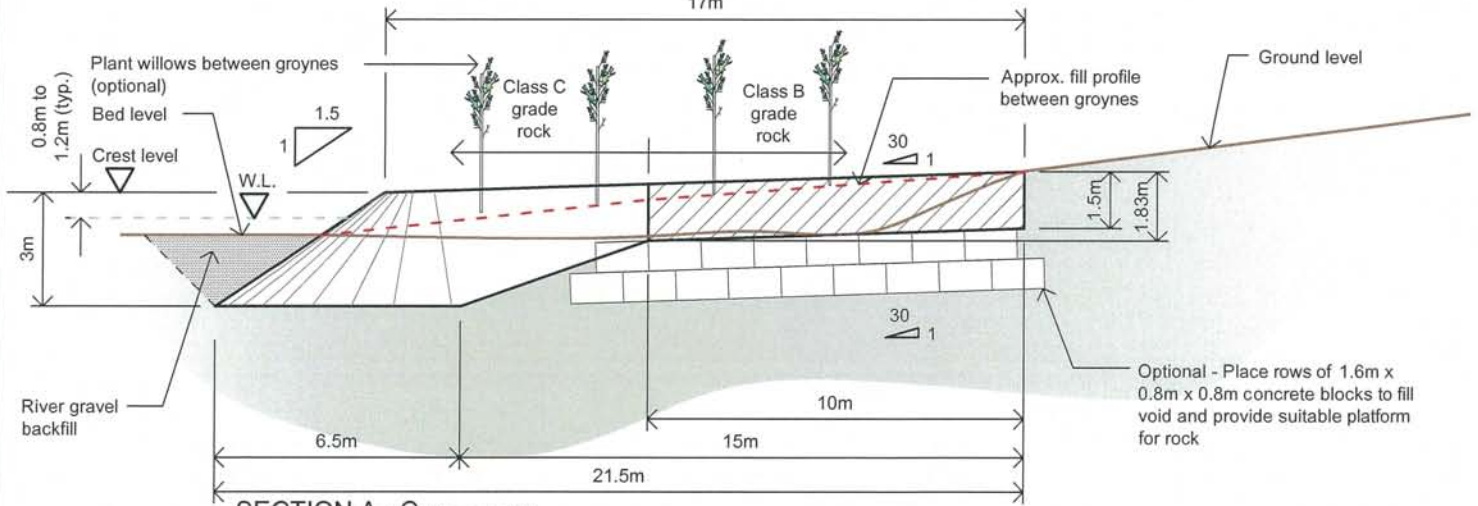
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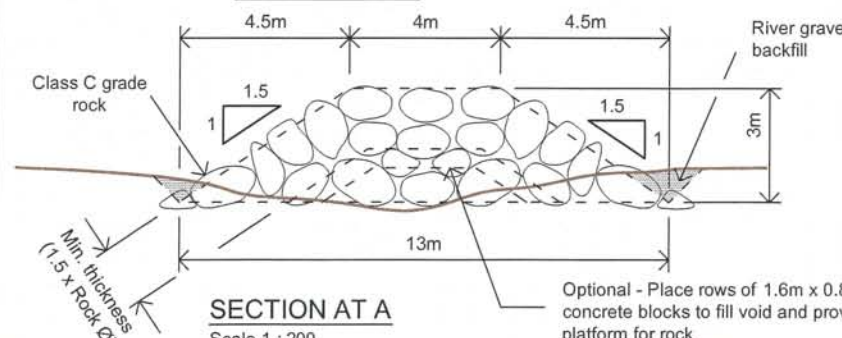
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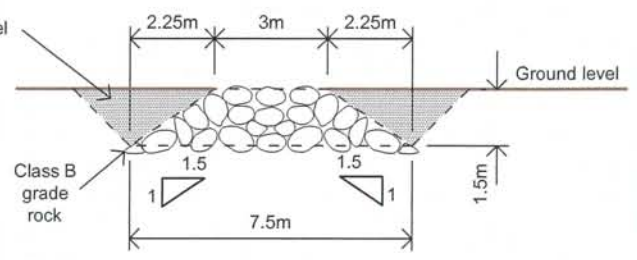
PLAN
 Scale 1 : 200



SECTION A - C
 Scale 1 : 200



SECTION AT A
 Scale 1 : 200



SECTION AT C
 Scale 1 : 200

VERSION #	1

EROSION REPAIR
 RIVER
 STANDARD DETAIL
 ROCK GROUYNE (500 TONNE)

DESIGN	COMPILED	April 2013
DRAWN	P. COOK	April 2013
CHECKED	CCMUNN	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No.	RL-5317 / 20	
FILE N/50/2/6	Cad:	RL-5317_C.dwg

NOTE :
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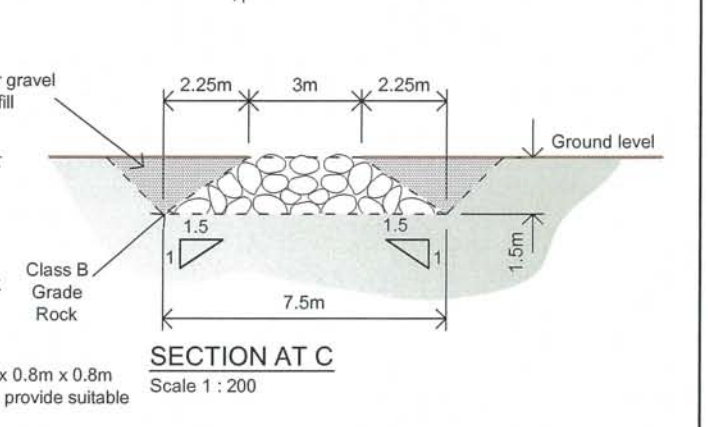
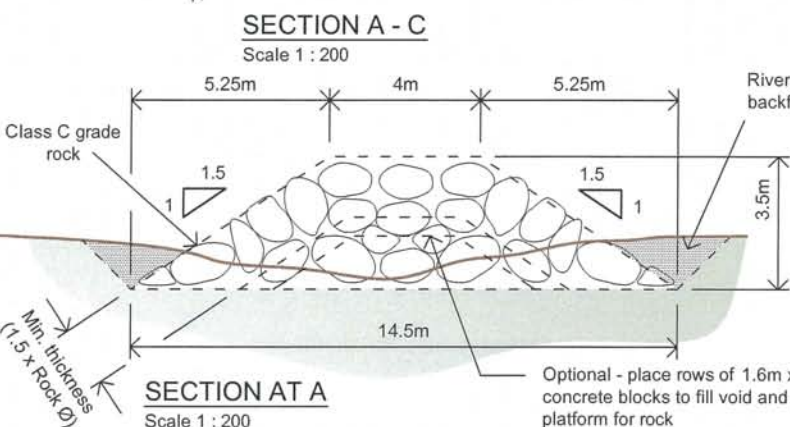
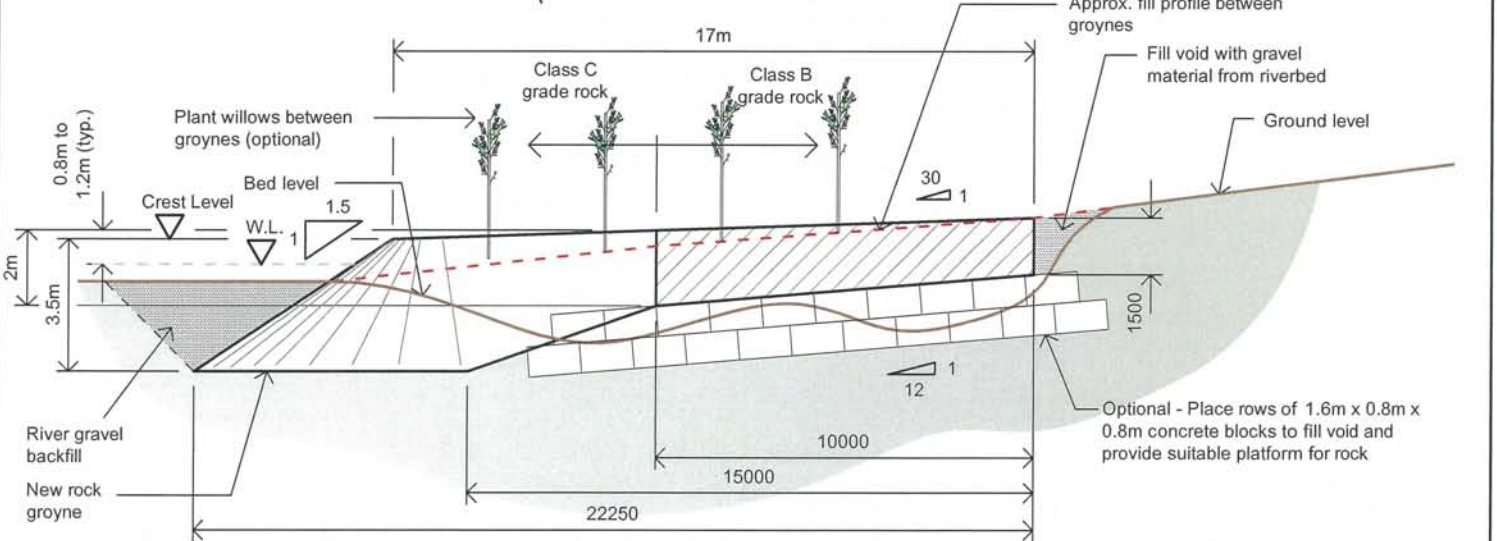
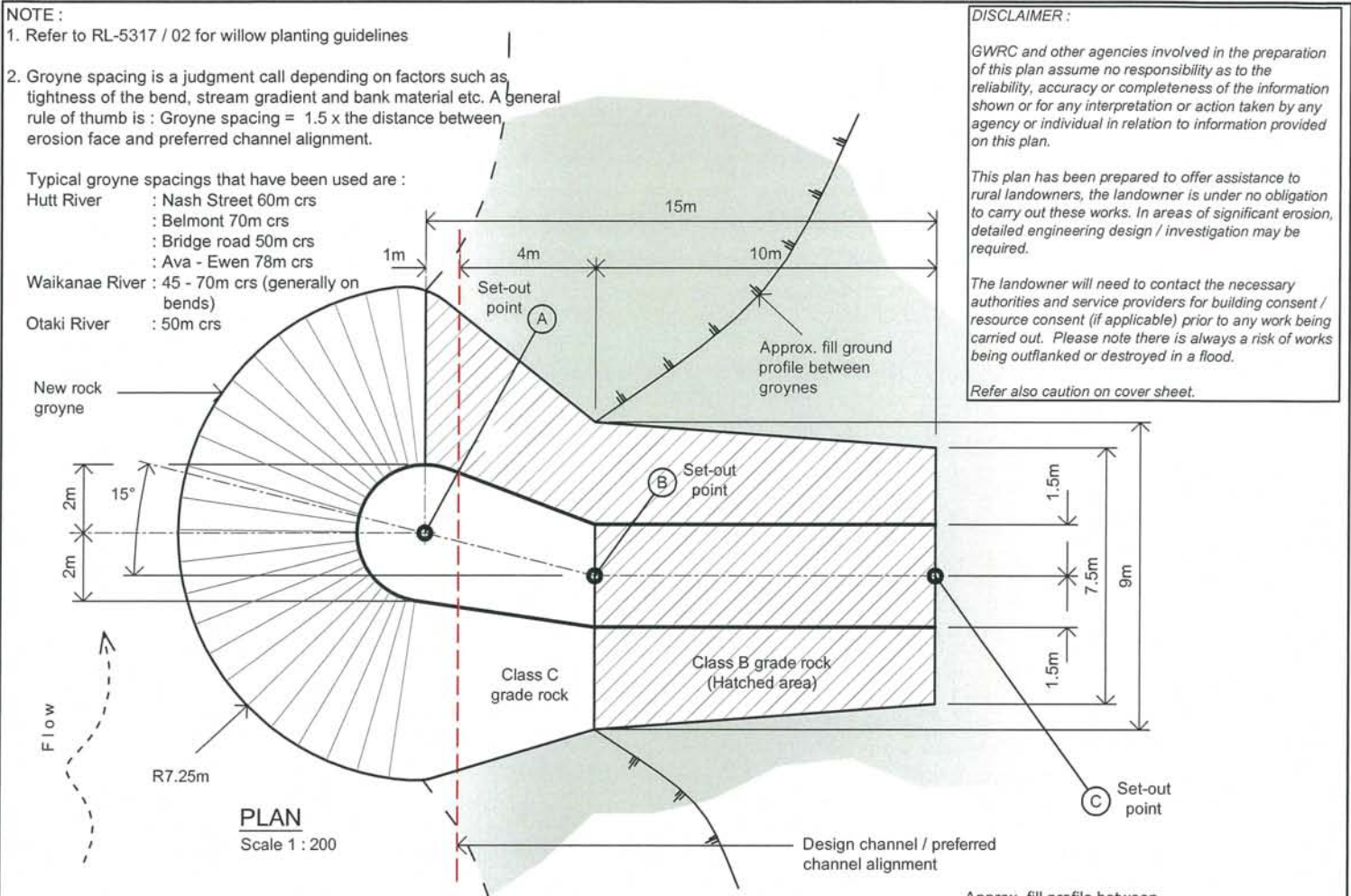
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	VERSION #	<h1>EROSION REPAIR</h1> <p>RIVER STANDARD DETAIL ROCK GROYPNE (650 TONNE)</p>	DESIGN	COMPILED	April 2013
	1		DRAWN	P. COOK	April 2013
			CHECKED	CC Munn	3/5/13
			APPROVED	[Signature]	6/5/13
			Drawing No.	RL-5317 / 21	
			FILE N/50/2/6	Cad: RL-5317_C.dwg	

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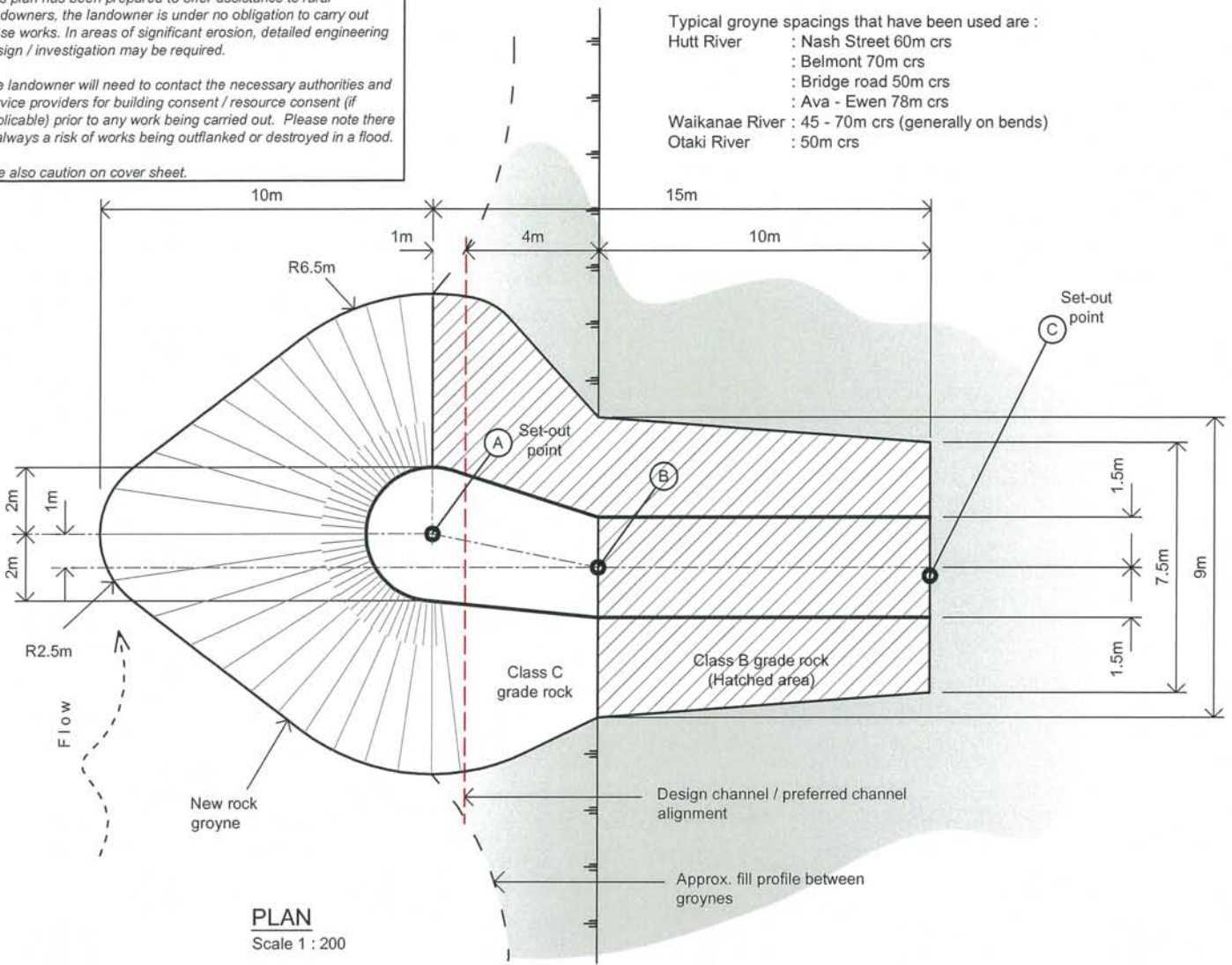
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NOTE :

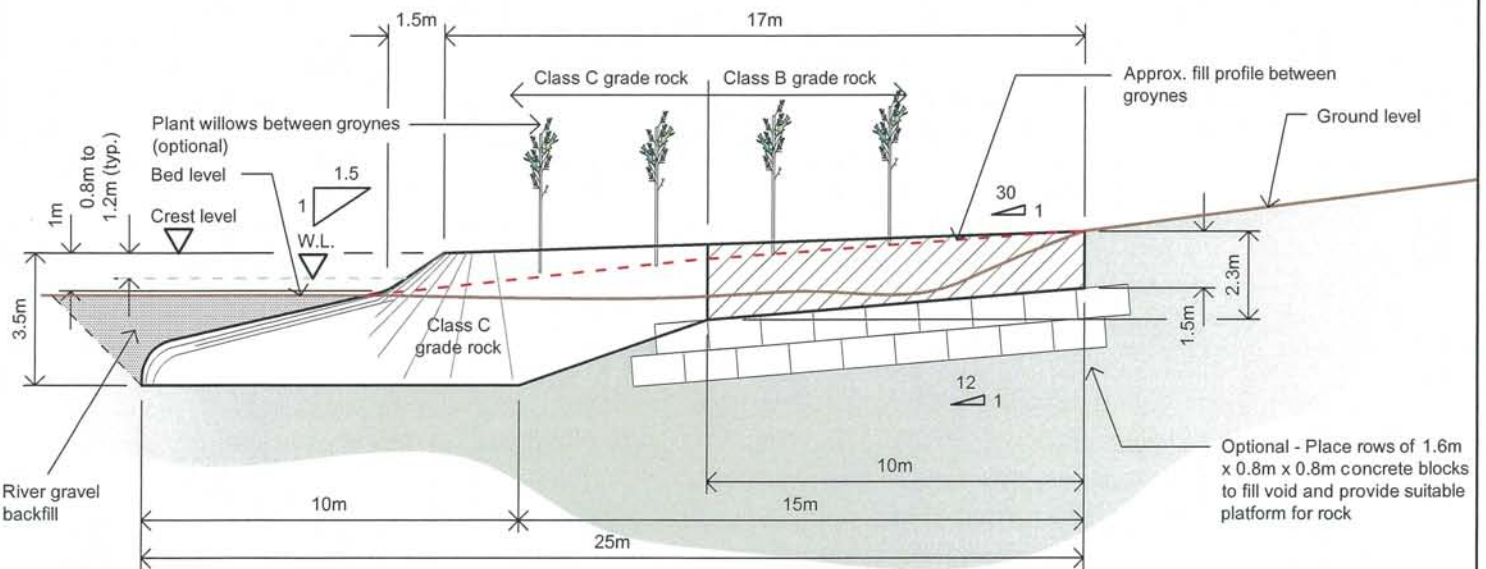
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PLAN
Scale 1 : 200



SECTION A - C
Scale 1 : 200

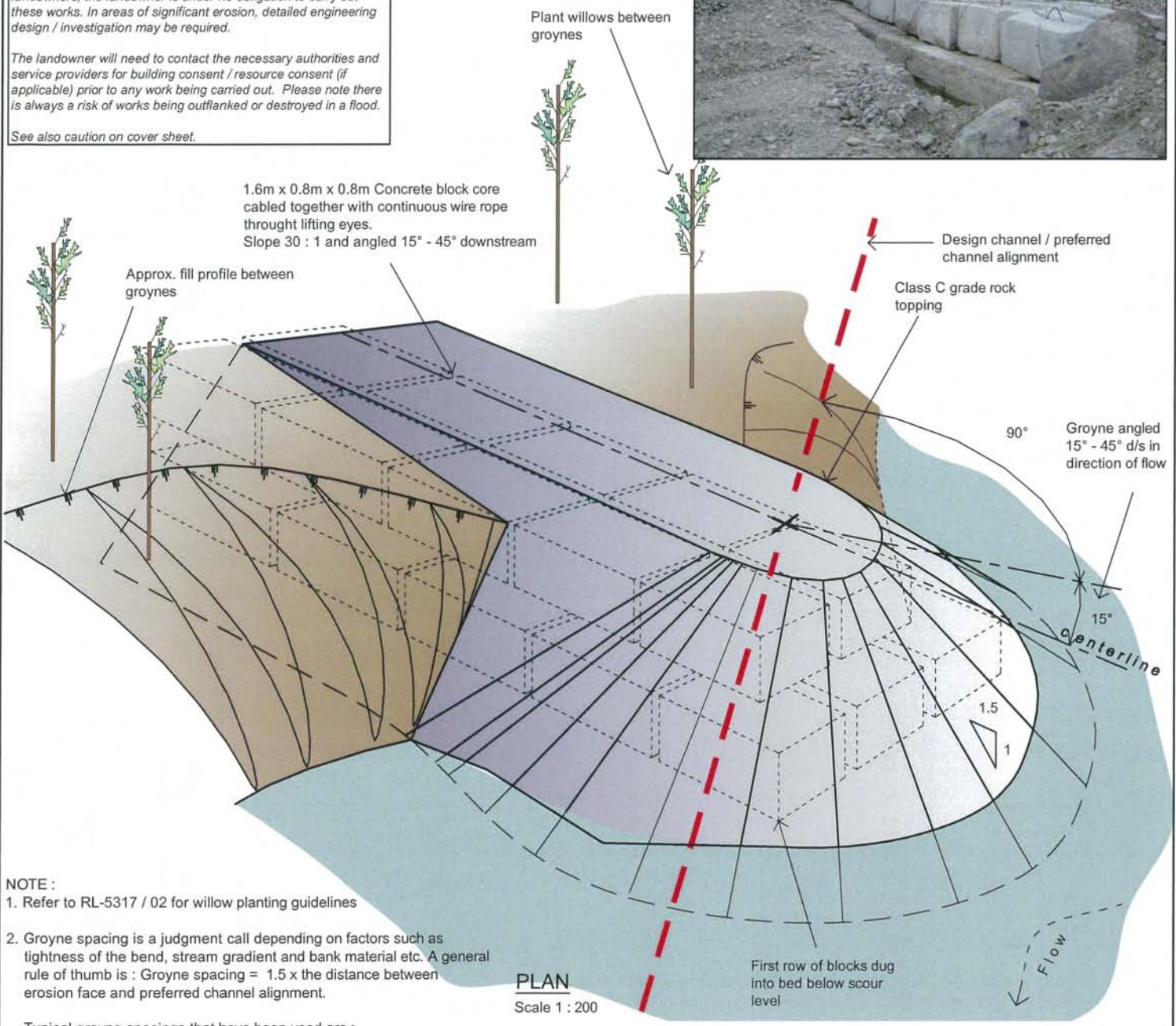
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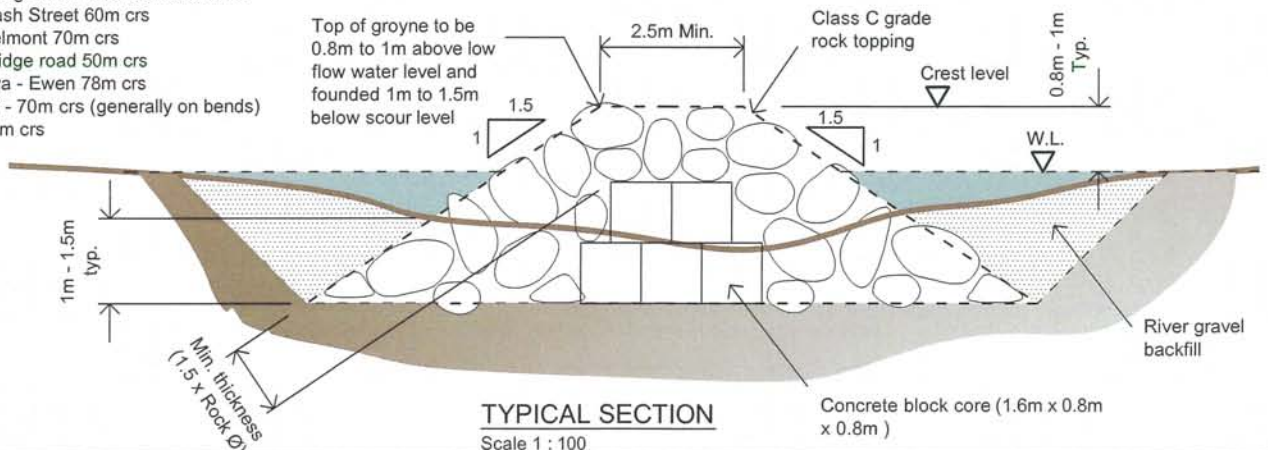
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See also caution on cover sheet.



- NOTE :**
1. Refer to RL-5317 / 02 for willow planting guidelines
 2. Groyne spacing is a judgment call depending on factors such as tightness of the bend, stream gradient and bank material etc. A general rule of thumb is : Groyne spacing = 1.5 x the distance between erosion face and preferred channel alignment.

- Typical groyne spacings that have been used are :
- Hutt River : Nash Street 60m crs
 - : Belmont 70m crs
 - : Bridge road 50m crs
 - : Ava - Ewen 78m crs
 - Waikanae River : 45 - 70m crs (generally on bends)
 - Otaki River : 50m crs

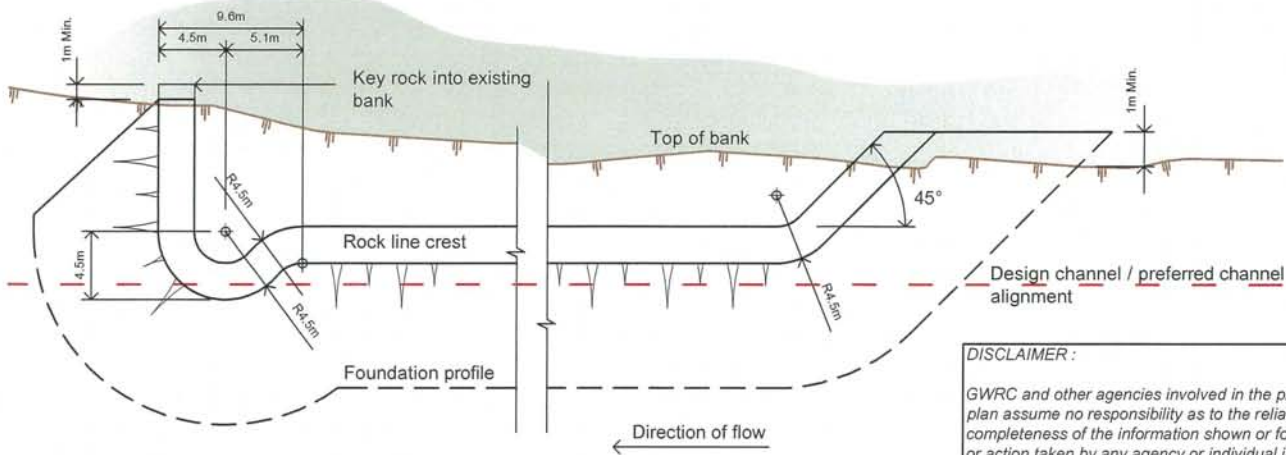


VERSION #
1

EROSION REPAIR

RIVER STANDARD DETAIL CONCRETE BLOCK CORE GROUYNE

DESIGN	COMPILED	April 2013
DRAWN	P.COOK	April 2013
CHECKED	ce mun	3/5/13
APPROVED	<i>[Signature]</i>	6/5/13
Drawing No.	RL-5317 / 23	
FILE N/50/2/6	Cad: RL-5317_C.dwg	



ROCK LINING PLAN - End Return and Snub Groyne

Scale 1 : 500

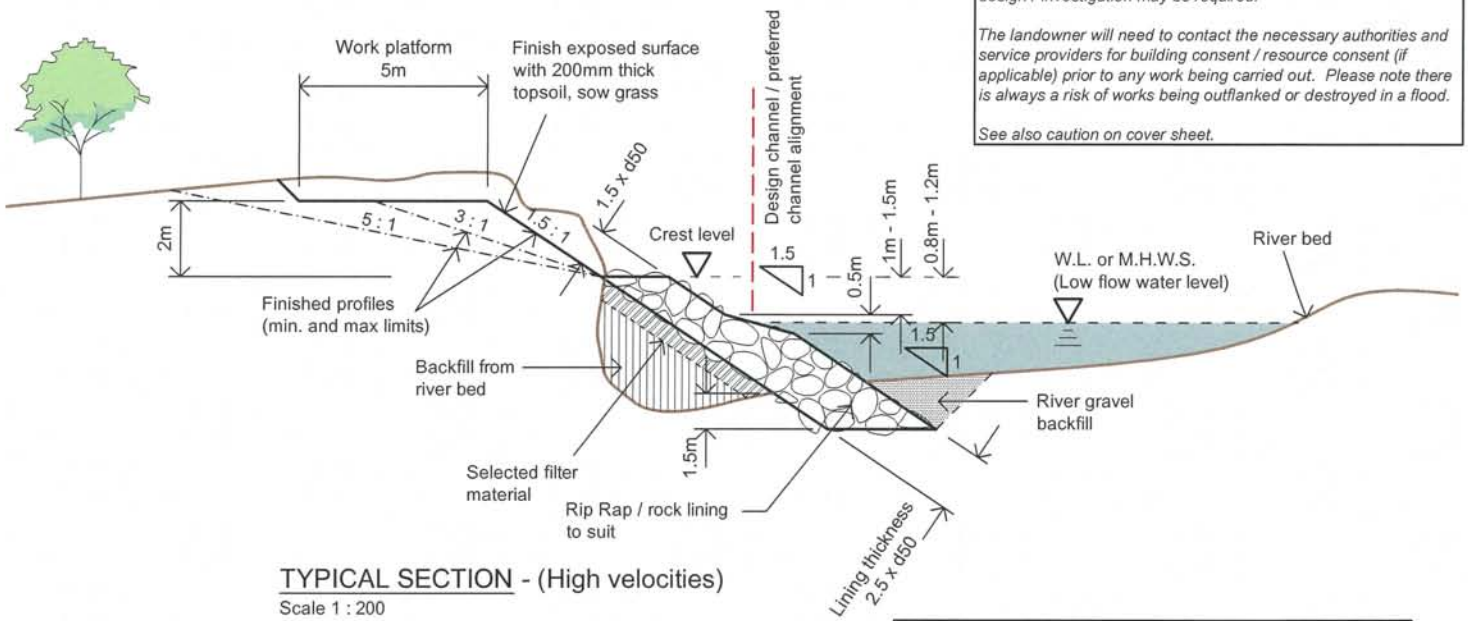
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See also caution on cover sheet.

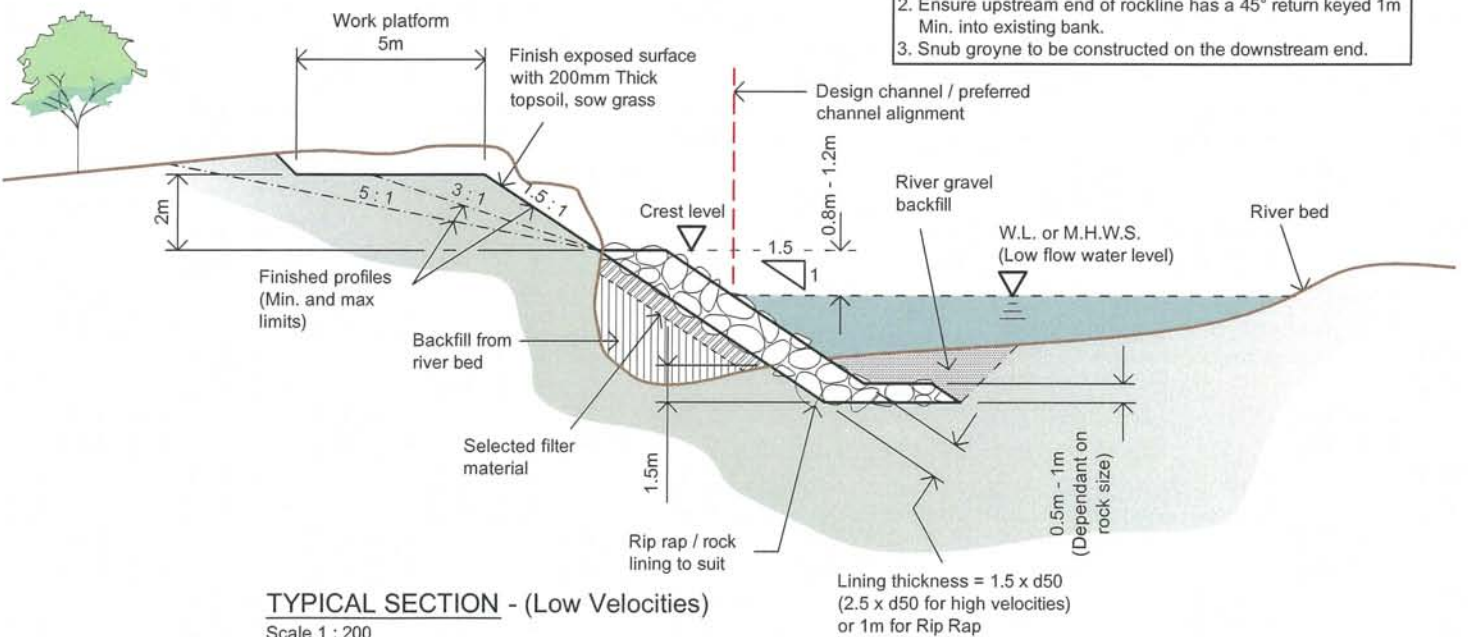


TYPICAL SECTION - (High velocities)

Scale 1 : 200

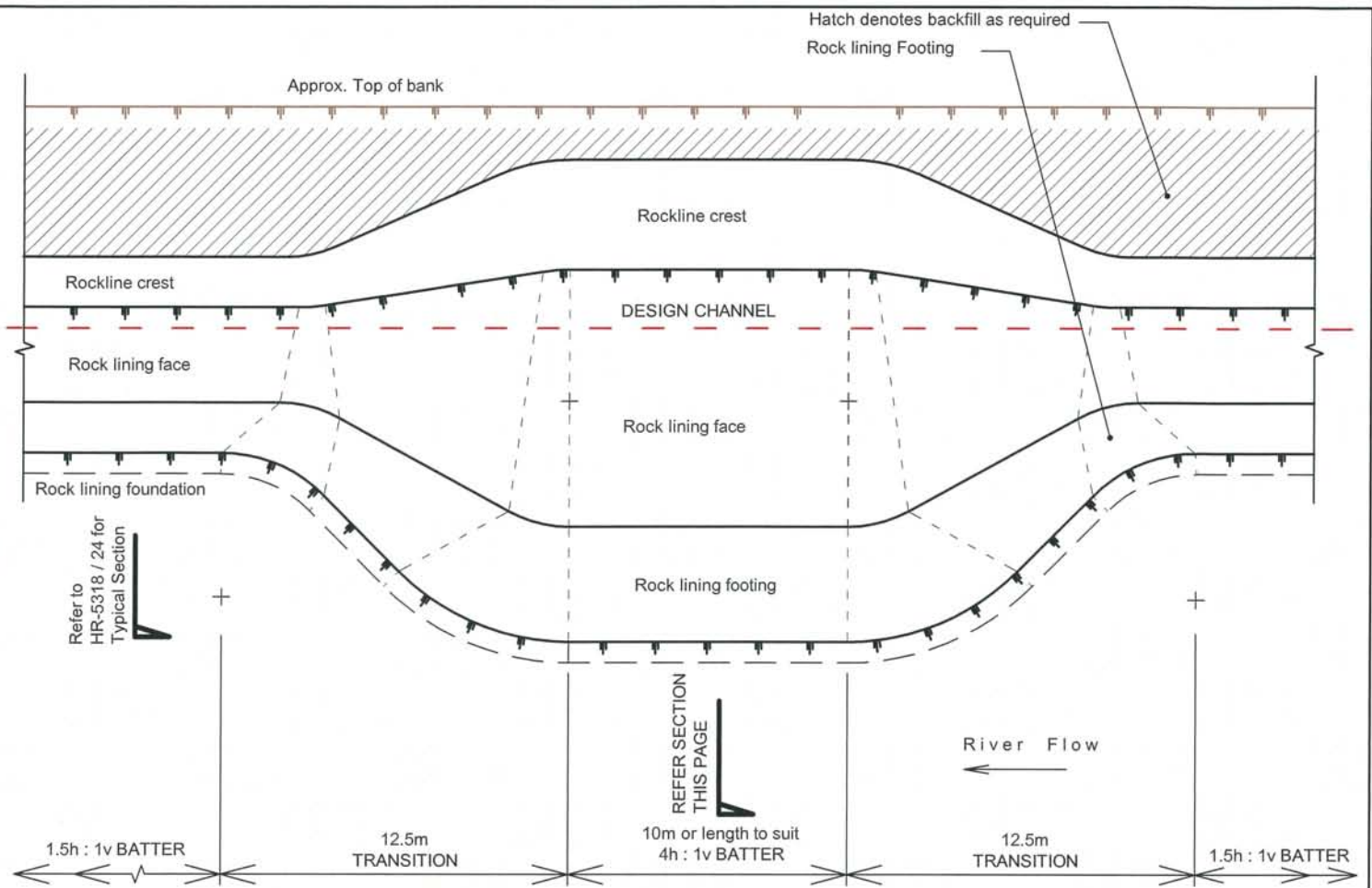
Notes :

1. d50 denotes average rock diameter
2. Ensure upstream end of rockline has a 45° return keyed 1m Min. into existing bank.
3. Snub groyne to be constructed on the downstream end.



TYPICAL SECTION - (Low Velocities)

Scale 1 : 200



PLAN

Scale 1 : 250

Notes:

1. Dimensions are shown in mm unless stated otherwise.
2. Batter slope varies to provide variation in habitat conditions
3. Place a suitable rooting medium over the riprap and revegetate with suitable species as soon as possible after vegetation is destroyed and soil washed away particularly where whitebait spawning occurs.
4. Refer also to the waikanae river environmental strategy (version 3)
5. Refer to drawing RL-5317 / 24 for typical rock / rip rap lining dimensions & profile

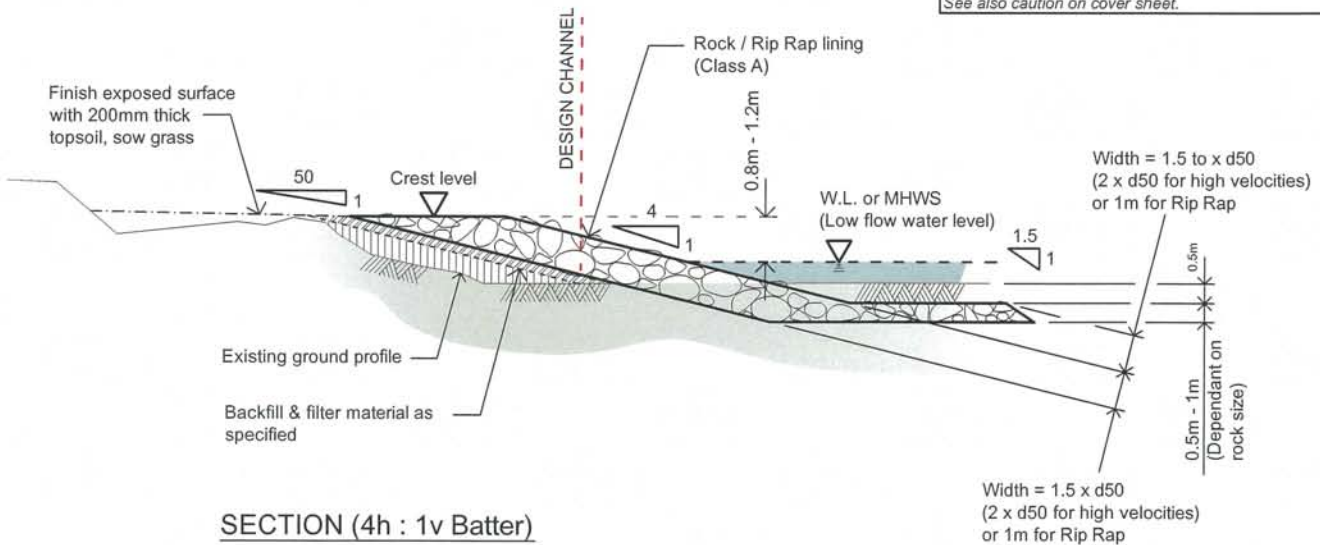
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See also caution on cover sheet.



SECTION (4h : 1v Batter)

Scale 1 : 200 Hor. & Vert.

VERSION #
1

DESIGN	COMPILED	April 2013
DRAWN	P.COOK	April 2013
CHECKED	C.C.MUNN	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No. RL-5317 / 25		
FILE N/50/2/6	Cod: RL-5317_C.dwg	

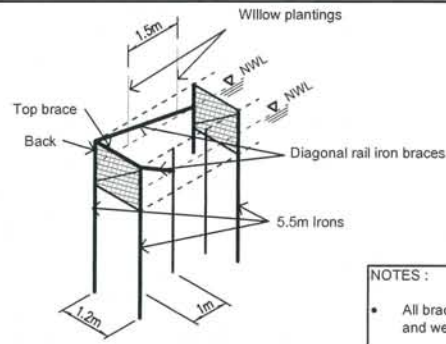
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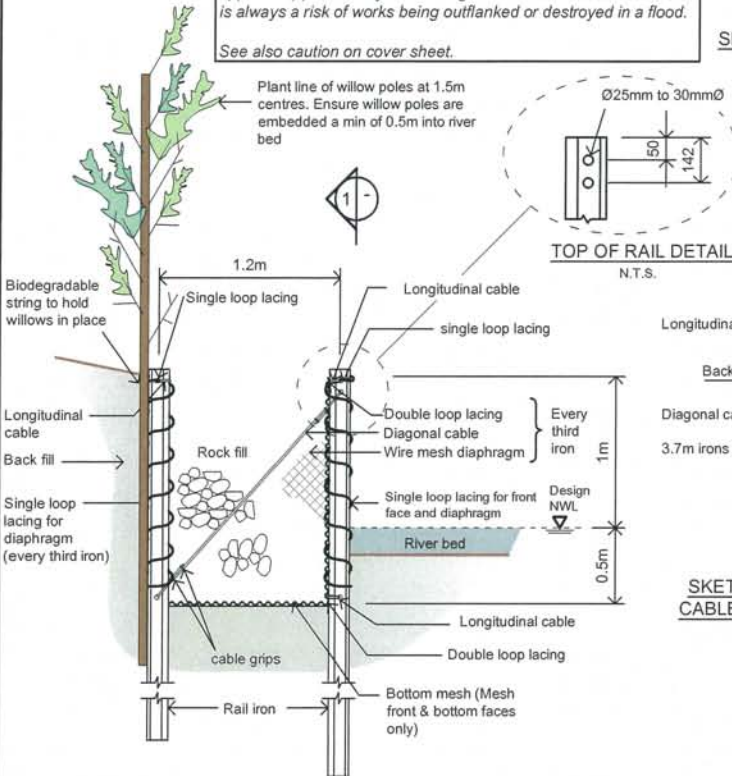
See also caution on cover sheet.



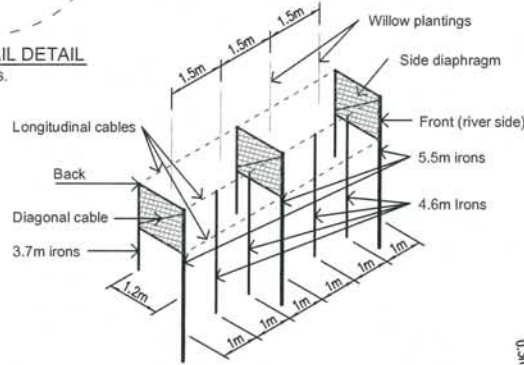
**SKETCH SHOWING GABION END DETAIL
DOWN STREAM END OF WALL**
N.T.S.

NOTES :

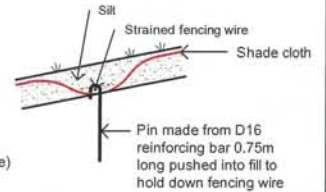
- All braces to be formed using 55lb rail irons and welded in place
- Refer also HR-5317 / 28 for general notes.



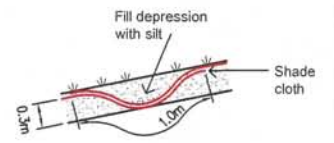
**Rail iron and GABION BASKET
CROSS SECTIONAL DETAIL**
N.T.S.



**SKETCH SHOWING DIAPHRAM RAIL IRON
CABLE AND WILLow PLACEMENT DETAILS**
N.T.S.



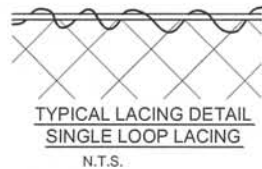
ANCHOR DETAIL
N.T.S.



OVERLAP DETAIL
N.T.S.

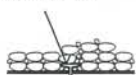


**TYPICAL LACING DETAIL
DOUBLE LOOP LACING**
N.T.S.

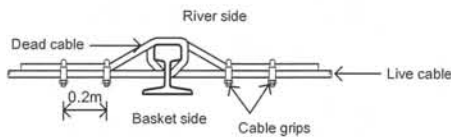


**TYPICAL LACING DETAIL
SINGLE LOOP LACING**
N.T.S.

Railway iron posts. Base to be on bank side of fence. Gas cut 25-30mm diameter hole in web for longitudinal cables

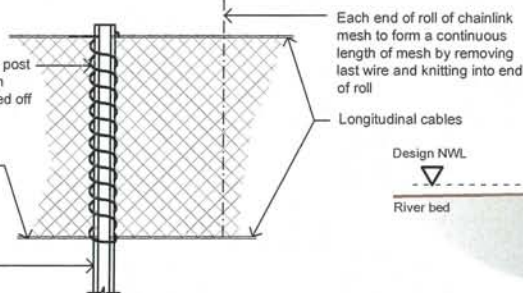


PLAN
N.T.S.

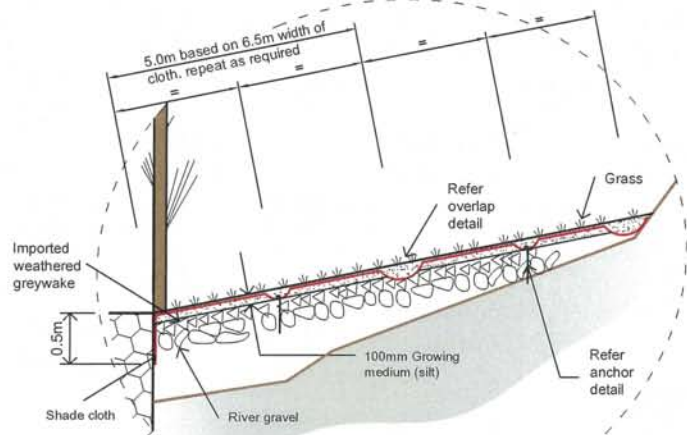


**TYP LONGITUDINAL CABLE
JOINING DETAIL**
N.T.S.

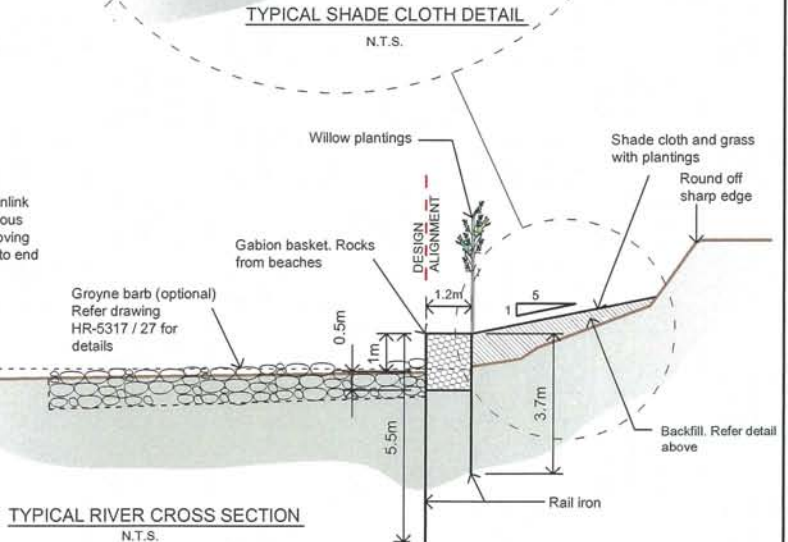
Mesh to be laced to every third post using single loop lacing through alternate netting links. lacing tied off around top and bottom cable



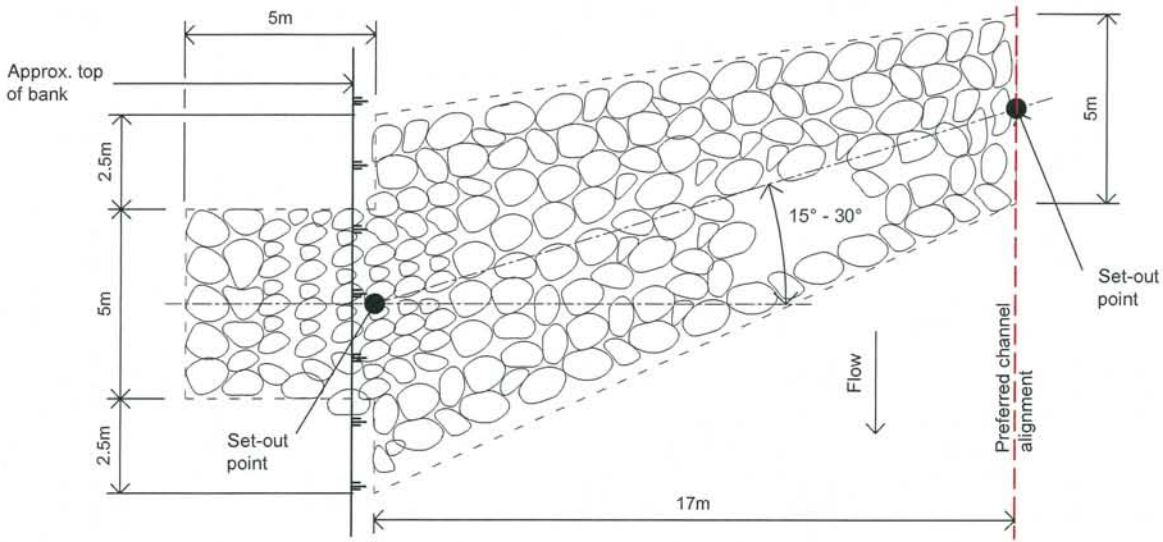
VIEW 1 RIVER BED LEVEL NOT SHOWN
N.T.S.



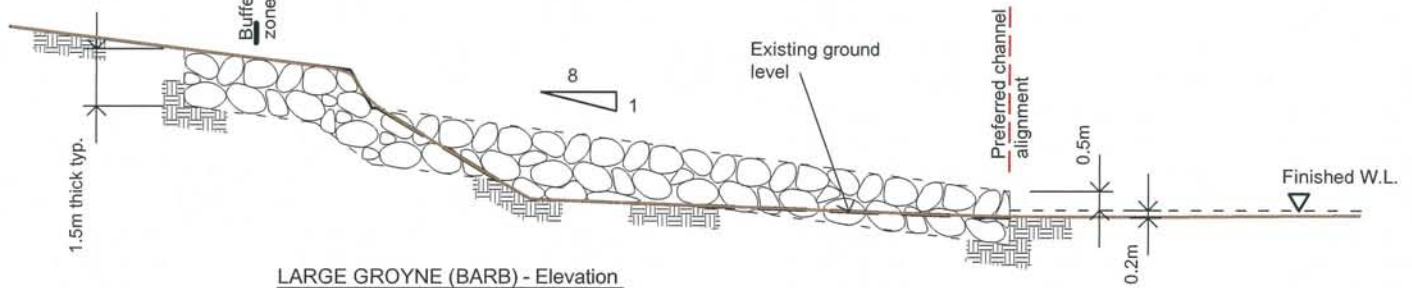
TYPICAL SHADE CLOTH DETAIL
N.T.S.



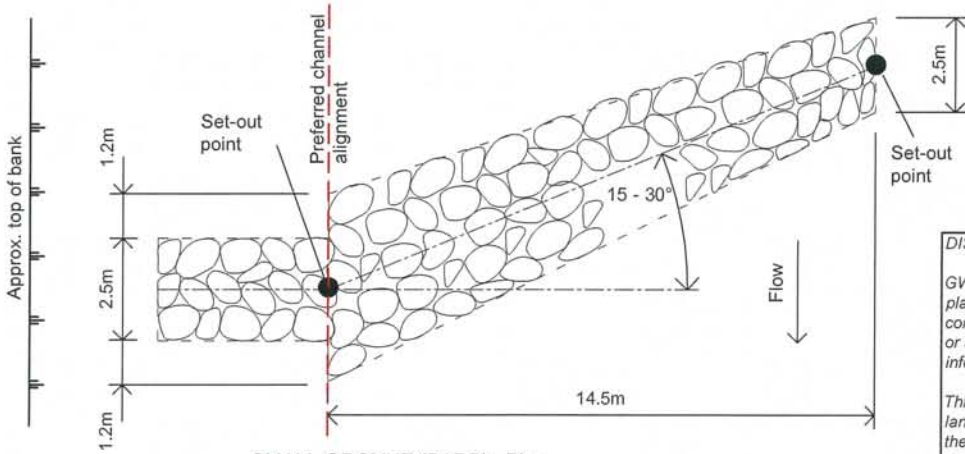
TYPICAL RIVER CROSS SECTION
N.T.S.



LARGE GROYNES (BARB) - Plan
Scale 1 : 200



LARGE GROYNES (BARB) - Elevation
Scale 1 : 200



SMALL GROYNES (BARB) - Plan
Scale 1 : 200

- NOTES :**
- Refer to HR-5317 / 28 for general notes.
 - Refer to HR-5317 / 26 for gabion details

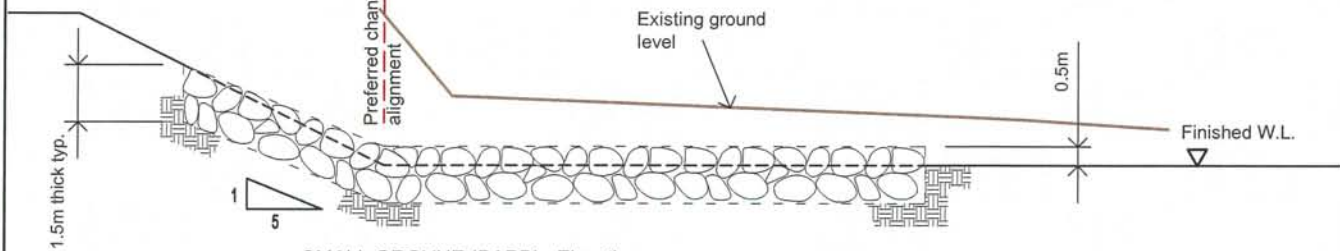
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See also caution on cover sheet.



SMALL GROYNES (BARB) - Elevation
Scale 1 : 200

VERSION #
1

EROSION REPAIR

RIVER
STANDARD DETAIL
GROYNE BARB Sheet 2 of 3

DESIGN	COMPILED	April 2013
DRAWN	P. COOK	April 2013
CHECKED	C. C. Munn	3/5/13
APPROVED	[Signature]	6/5/13
Drawing No.	RL-5317 / 27	
FILE N/50/2/6	Cad:	RL-5317_C.dwg

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See also caution on cover sheet.

NOTES :

GENERAL

- All dimensions in millimeters unless noted otherwise

RAILWAY IRONS

- All railway irons to be in good condition and without significant corrosion
- Railway irons to be founded with no more than 200mm cut off for driving head damage
- All railway irons to be driven within 100mm of location shown on the drawing and shall be within a vertical tolerance of 1:50
- Top of the Railway irons to be uniform grade between set out levels

CABLES

- Cables shall be 14mm or 12mm Ø galvanised wire rope
- The three longitudinal cables shall be passed through holes in the web of each iron and tied off at every 50m as shown in the details RL-5317 / 27
- Diagonal cables shall be placed every 3m (at the same location as mesh diaphragms).
- All cable tie-offs shall be made using two galvanised steel wire grips.
- Cables shall be tensioned and tied off such that all kinks or curvature in the wires are straightened out and so that they do not deflect under moderate hand pressure between points of support

MESH and LACING WIRE

- All mesh to be used shall be 75mm mesh size, 2.5mm galvanised wire core, 3.6mm of green plastic coated chain-link.
- The end of roll of chain-link mesh is to have the end wire removed and knitted into the next so that it forms a continuous length.
- All lacing wire shall be 2.2mm galvanised wire core, 3.2mm of green plastic coated wire.
- Ends of all lacing to be tied off around a railway iron or cable (no intermediate joins), use fencing knots.
- Front mesh to be tied to the longitudinal cables using double loop lacing through every netting link.
- Front mesh and diaphragms to be tied to every third rail iron (at same location as diagonal cables) using single loop lacing through alternate netting links.
- Top mesh to be tied to the longitudinal cables and top of each diaphragm using single loop lacing


WILLOW POLES

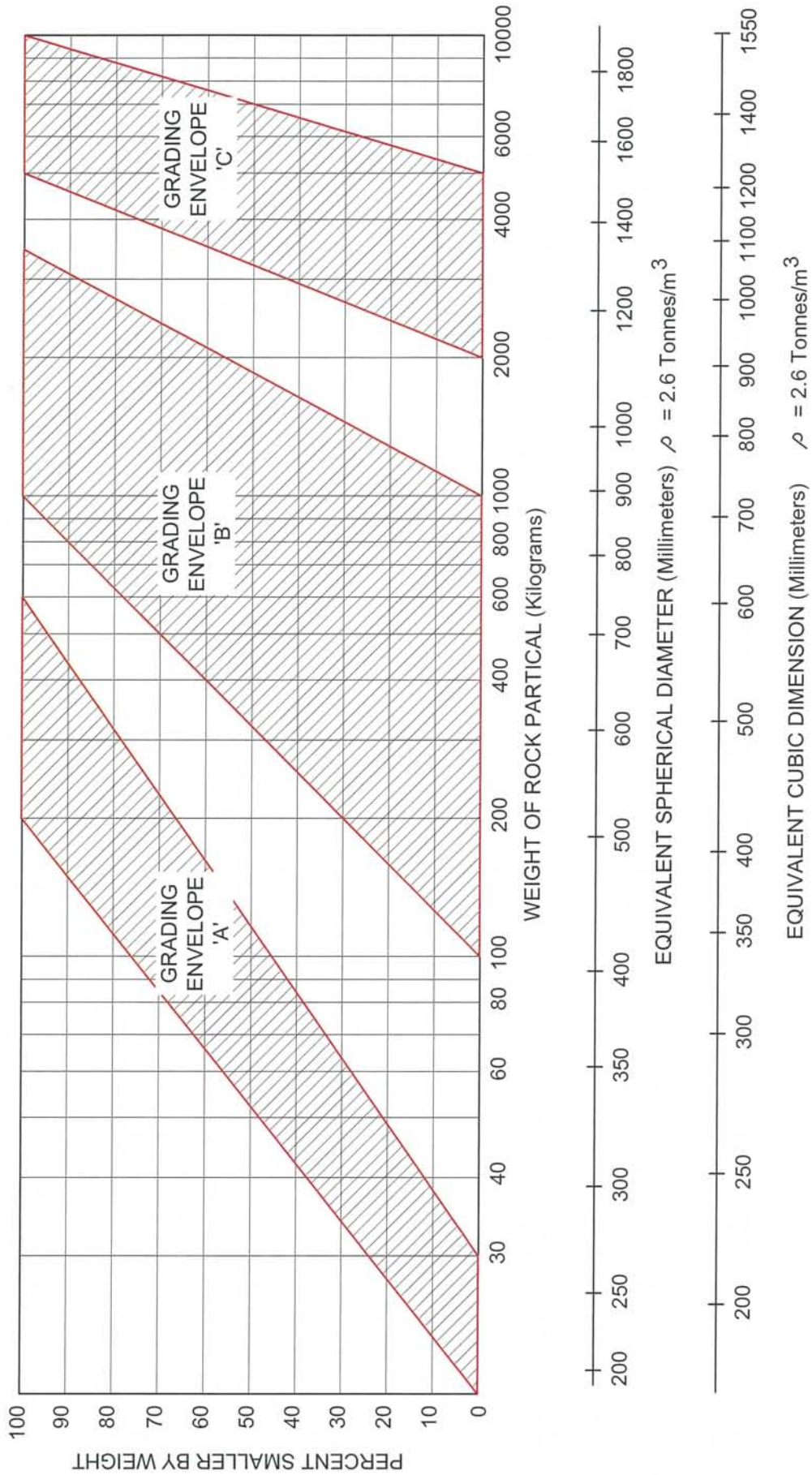
- 2.5m - 3.0m Matsudana willow poles are to be tied to the top longitudinal cable at the rear of the gabion basket at 1.5m centres using biodegradable string prior to back filling.
- Poles are to be founded so the base is embedded at least 0.5m below water.

SHADE CLOTH

- Shade cloth to be used is super haitex.
- Cloth is to be laid length-wise along the works with 0.5m of the end of each 6.5m wide roll fixed as shown in the diagram. The end of each roll is to be overlapped on on top of the downstream roll by at least 1m.
- Each roll of shade cloth shall be pinned down along the the centre of the roll using strained fencing wire pinned down at 30m intervals using 750mm long pins formed from D16 reinforcing steel as detailed on drawing RL-5317 / 20.

REFER TO HR-5317 / 25 and / 26 FOR DETAILS

 <p>greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao</p>	VERSION #	<h1>EROSION REPAIR</h1> <p>RIVER STANDARD DETAIL GABIONS - General Notes (Sheet 3 of 3)</p>	DESIGN	COMPILED	April 2013
	1		DRAWN	P.COOK	April 2013
			CHECKED	<i>E.C Munn</i>	3/5/13
			APPROVED	<i>[Signature]</i>	6/5/13
			Drawing No. RL-5317 / 28		
			FILE N/50/2/6	Cad: RL-5317_C.dwg	



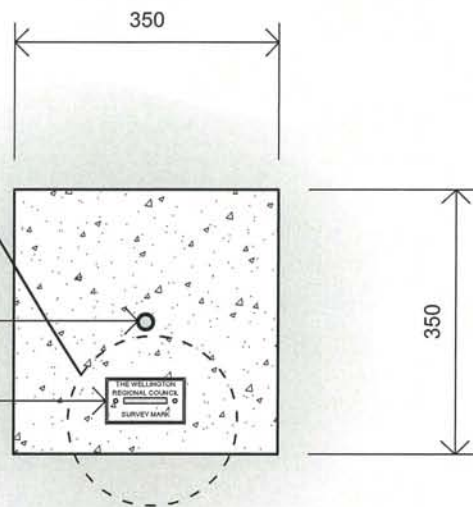


NOTES :

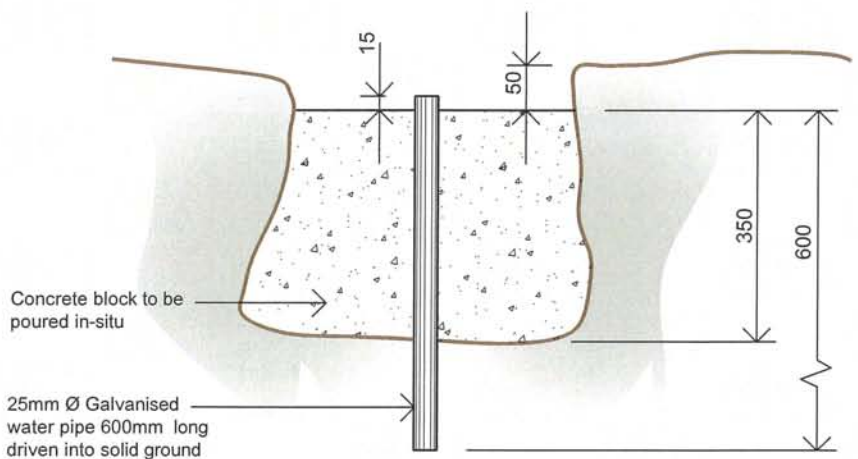
1. Dimensions in millimetres (mm)
2. Existing plaques can be reused if not damaged
3. Plaques to be manufactured from certified gunmetal ingot, LG 2 to BS1400
4. Crystalline structure of final plaque to be suitable for marking by indenting punch
5. Lettering and marking box to be smooth ground
6. Plaques to be drilled with 2 No. 6.5mm Ø holes
7. Minimum lettering height 7mm
8. Refer also to A4-8170 / 01-RC and 02-RC & HR-5310 / 05 for similar details

S.S. Pin or G.I. Pipe

Brass name plate.
(Refer detail left)




PLAN
N.T.S.

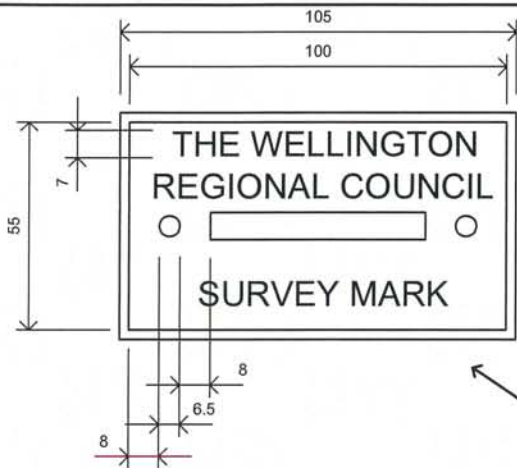


SECTION
N.T.S.

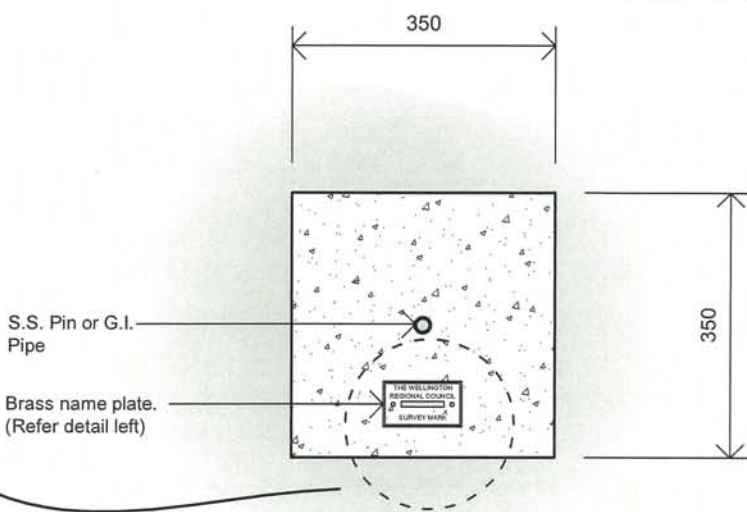
NOTES :

- 1) Refer to RL-5317 / 31 for areas of pedestrian access
- 2) Refer also to A4-8170 / 01-RC and 02-RC & HR-5310 / 05 for similar details

 greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao	VERSION #	<h1>EROSION REPAIR</h1> <p>STANDARD DETAIL - GWRC SURVEY MARKS CONTROL / SIGHTING POINTS INSTALLATION DETAILS AREAS OF NO PEDESTRIAN ACCES</p>	DESIGN	COMPILED	April 2013
	1		DRAWN	P. COOK	April 2013
			CHECKED	C. MUNN	3/5/13
			APPROVED	G.A.C.	6/5/13
			Drawing No. RL-5317 / 30		
			FILE N/50/2/6	Cod: RL-5317_C.dwg	

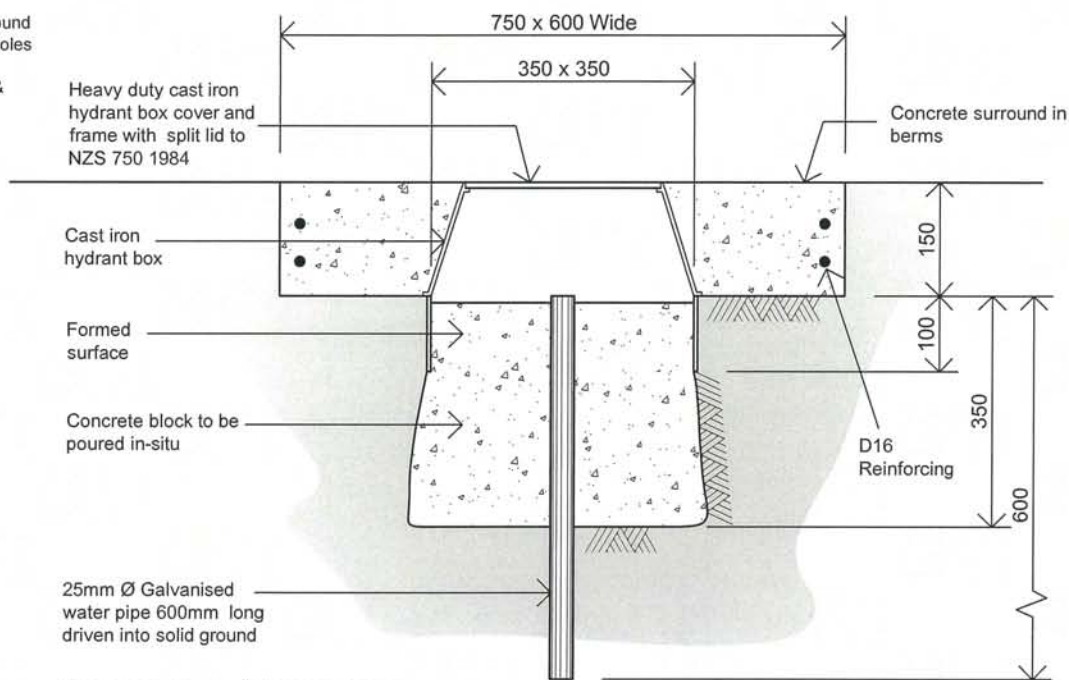


PLAQUE DETAIL
N.T.S.

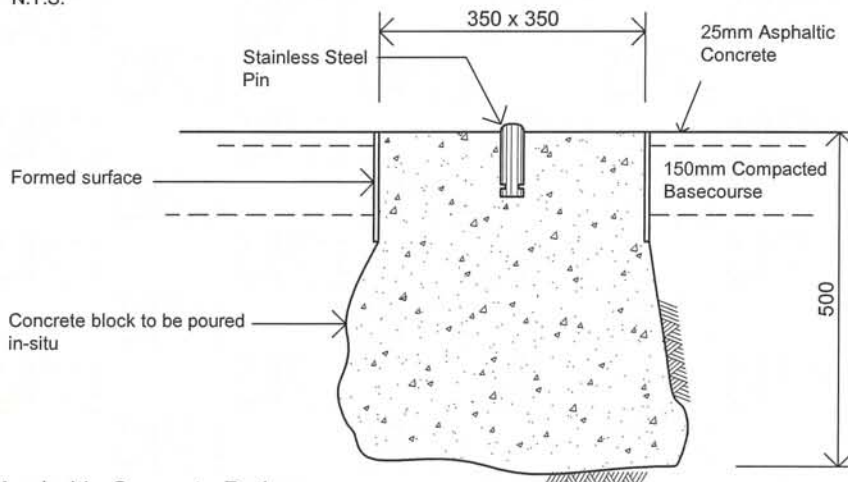


PLAN
N.T.S.

- NOTES :**
1. Dimensions in millimetres (mm)
 2. Existing plaques can be reused if not damaged
 3. Plaques to be manufactured from certified gunmetal ingot, LG 2 to BS1400
 4. Crystalline structure of final plaque to be suitable for marking by indenting punch
 5. Lettering and marking box to be smooth ground
 6. Plaques to be drilled with 2 No. 6.5mm Ø holes
 7. Minimum lettering height 7mm
 8. Refer also to A4-8170 / 01-RC and 02-RC & HR-5310 / 05 for similar details



Grassed Areas / Access Ways
N.T.S.



Asphaltic Concrete Pathways
N.T.S.

DISCLAIMER :

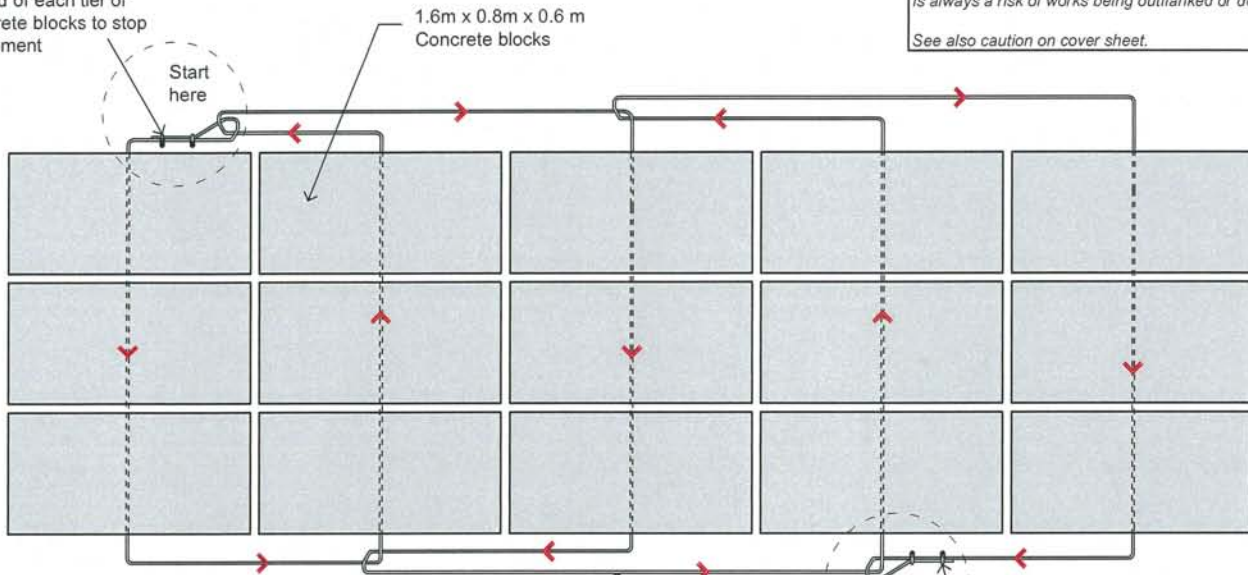
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See also caution on cover sheet.

Wire grips on wire rope at end of each tier of concrete blocks to stop movement



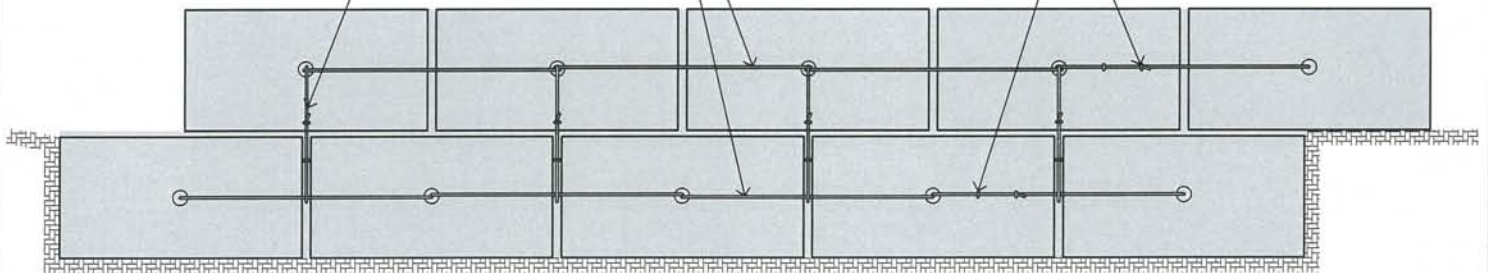
PLAN
Scale 1 : 50

Continuous 16mm Dia. wire rope looped back on each line of blocks

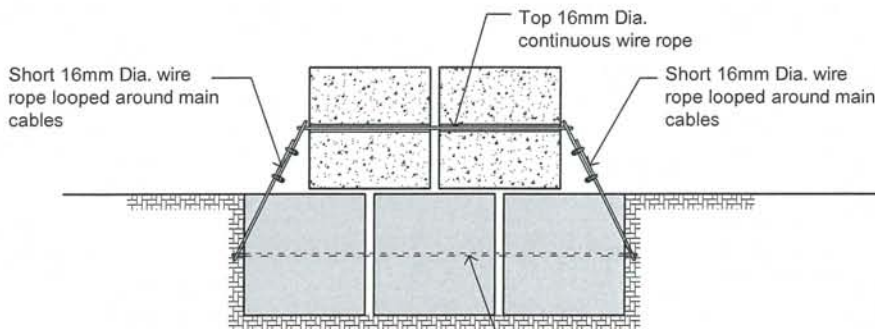
Finish here

Wire grips on wire rope at end of each tier of concrete blocks to stop movement

Short 16mm Dia. wire rope tying concrete block layers together



ELEVATION
Scale 1 : 50



SECTION A - A
Scale 1 : 50

Top 16mm Dia. continuous wire rope

Short 16mm Dia. wire rope looped around main cables

Short 16mm Dia. wire rope looped around main cables

Bottom 16mm Dia. continuous wire rope

VERSION #
1

EROSION REPAIR

RIVER
STANDARD DETAIL
TYPICAL CONCRETE BLOCK CABLING DETAIL

DESIGN	COMPILED	April 2013
DRAWN	P.COOK	April 2013
CHECKED	CCMUNA	3/5/13
APPROVED	<i>[Signature]</i>	6/5/13
Drawing No. RL-5317 / 32		
FILE N/50/2/6	Cad: RL-5317_C.dwg	