Structural
Civil
Stormwater
Telecommunications

MYD Consulting Engineers Pty Ltd
ABN: 36 102 975 600
Level 1, 230 Victoria Road, Gladesville NSW 2111
Tel: 02 9817 2611 Fax: 02 9817 2633
Email: info@mydconsulting.com

STORMWATER AND FLOOD STUDY REPORT

FOR

RESIDENTIAL DEVELOPEMNT

AVON ROAD, PYMBLE

DATED 17 December 2009

Table of Contents

1. INTRODUCTION

The proposed site is located between Beechworth St on the West, Avon Road on the East, the north shore railway line on the North and Arilla Road on the South.

The proposed site is affected by the following existing stormwater system components:

- An open natural channel with a variable shape along its length located approximately through the middle of the site

- An Existing culvert 0.7m H x 1.20m wide located at the bottom of the proposed site (refer to flood Study - STN 14.00)

Five off multi storey apartment blocks are proposed within the site. The building layouts are shown in architectural documentation proposed by Ancher Mortlock Woolley Architects (refer to **Attachment_2)**.

The contributing catchment area has been determined based on the combined contour plan from Department of Lands and detailed survey plan (refer to **Attachment 5)**.

A flood study was required to determine the 100 year ARI water surface levels (WSL) and to assess the impact of the proposed development on the flooding conditions.

1.1 Upstream Catchment and Council Stormwater Drainage System

The upstream Catchment consists of:

- Mixed residential developments
- A North Shore Railway Line
- The Pacific Hwy

The proposed site is also affected from the additional catchment area from the neighbouring sites located on Western and Eastern sites. The catchment plan is shown in **Attachment 5.**

The Council Stormwater drainage system is consists of:

- An inlet concrete culvert 1200mm wide x 700mm high located at the bottom of the proposed site STN 14 (refer to **Attachment 6)**.
- An Existing culvert and 900mm diameter pipe downstream of the transition structure. This culvert/pipe system conveys the stormwater further down to the open drain just downstream of the low point in Arilla Road

The existing culvert/pipe details have been extracted from the approved Hydraulic detail drawing No. N-95-8148 "B" dated 11-11-95 prepared by Ted Bennet & Associates (refer to **Attachment 3)**.

2. HYDROLOGY

2.1 Peak flow Rate

In order to determine the total 100-year ARI surface flow at the property, the contributing catchment has been determined as per the attached catchment plan **(refer to Attachment 5).**

The contour plan provided by the Land and Property Management Authority and the detailed survey plan prepared by Daw & Walton consulting surveyors job No:800-09 dated 02-10-2009 have been used to determine the catchment area

The total catchment area upstream of the site is approximately 4.89 hectares. It generally consists of a higher percent of paved area at the Pacific Highway, low and medium density residential buildings and the State Railway line just upstream along the Northern boundary of the proposed site.

The hydrologic model of the catchment has been set up in the Drains modelling program in accordance with Ku-ring-gai Council's Water Management Development Control Plan – DCP47 requirements.

It has been assumed that the total run-off flow for the 1 in 100 year ARI will arrive at the Northern boundary of the site ignoring any blockages of the existing stormwater drainage at State railway line. The catchment area has been subdivided and included in the hydrologic model to determine the peak flowrate at the property **(refer to Attachment 5).**

The calculated total flows from the catchment for the 100year ARI storm event are as follows:

	Existing Conditions	Proposed Conditions
Pit/Node	**100 year ARI Total Flowrate (m^3/s)**	**100 year ARI Total Flowrate (m^3/s)**
	m3/s	m3/s
Pacific Hwy	0.531	0.531
Cat U/S Railway line	1.43	1.43
State Railway Line	1.73	1.73
Catchment 5 - West	0.938	0.938
Catchment 5 – East	0.58	0.58
Proposed site	**0.938**	**0.151**
Total flow at pit 4	**3.22**	**2.433**
Node 4A	3.649	2.862
Akilla Rd – Node 8	4.126	3.33

The detailed calculations for the above flowrates have been shown in **Attachment 5.**

3. HYDRAULIC CALCULATIONS

3.1 Existing Stormwater System Capacity

The CulvertQ computer program has been used to estimate the capacity of the existing system (1200mmx700mm cilvert/900mm diameter pipe). The Capacity of the existing culvert is estimated to be 1.85m3/s and 1.5m3/s for the pipe just downstream of the transition near STN -14.00 (refer to **Attachment 6)**.

Taking into consideration a 50% pipe blockage factor, the effective pipe capacity has been estimated to 0.75m3/s.

3.2 Overland Flow Path

Existing underground culvert/pipe has been assumed to be 50% blocked as per Ku-ring-gai Council regulation for our overland flow calculation. Our calculations shows a total overland flow of 1.68m3/s at chainage (STN14.00) as shown in the hydraulic plan.

3.3 Modelling

As part of preparation for the hydraulic modelling, the detailed survey plan for this property has been used and the surface roughness and flow blockages were assessed by inspection. The HEC-RAS hydraulic model was used for the hydraulic analysis to identify the floodwater depths and velocities.

The adopted boundary conditions for modelling was the normal depth at the most upstream section (STN200.00) and most downstream sections (STN-80.6).

The full results (HEC-RAS profiles) of the hydraulic analysis for the cross sections through the proposed site for the existing and proposed site conditions are presented in **Attachment_7**.

The following modelling scenarios were undertaken.

3.3.1 Scenario 1 - Existing Condition

This identifies the existing flooding condition.

The model has been set up for the existing condition at all properties.

The computed water surface levels at the proposed site vary between RL120.30 and RL139.78m AHD.

The water depth varies between 0.28m to 1.99m through the site.

The depth x velocity products vary between 0.3m2/s to 0.9m2/s and only in one section at STN 43.00 it is 1.4m2/s and as such is exceeding the limits recommended by DES (maximum 0.4m2/s).

3.3.2 Scenario 2 – Proposed Condition without fences

This scenario assesses the direct impact of the proposed development on the flooding condition when comparing with the above scenario. Any increase in WSL as a result of increased building envelopes can then be determined.

The model has been set up for the proposed condition with a reshaped surface near the culvert and further down to STN -14.00 due to the proposed building..

The computed water surface levels at the proposed site vary between RL 119.91 and RL139.78m AHD.

The water depth varies between 0.28m to 1.47m through the site. The water depth is lower compared with the existing condition.

The depth x velocity products vary between 0.1m2/s to 0.7m2/s and as such is exceeding the limits recommended by DES (maximum 0.4m2/s). It has been noted that the velocity x depth products for the proposed condition are lower comparing with the existing condition.

There is a decrease in water surface levels at the site of up to 110mm at STN 169.00. There is an increase of 330mm only at section STN43.00 which can be ignored as it happening only in one section.

3.4 Increase in Rainfall Intensity

If the model is run with higher rainfall intensity the total run-off will be increased but due to the nature of the overland flow path still can accommodate the increased run-off with the minimal reshaping of the overland flwopath.

3.5 Potential effects of climate chage

The climate change may increase or decrease the amount of the rainfall. As previously advised in the Section 4.4 the change in rainfall intensity will not significantly effect to the overland flow path.

3.6 Sea Levels Rise

The proposed site is not affected by sea level rises as the lowest level of the site is RL116.25 and which is higher than sea level.

3.7 Water Sensitive Urban Design Measures

Water Sensitive Urban Design measures must be implemented. The proposed BCP gross pollutant traps remove gross pollutants and suspended solids from stormwater, preventing spills and minimizing non-point source pollution entering downstream waterways. These Ceptors must be constructed as shown on the stormwater drainage plans.

3.8 Safety

The Provisional Hydraulic Hazard (combination of water depth and velocity) was determined as specified in the NSW Floodplain Development Manual L2

- The Hydraulic Hazard at each cross section falls within the low to medium category except at STN43.00 where the value belongs in the high category which can be ignored as an anomaly.

3.9 Stormwater measures

The stormwater measures taken for this project will reduced the total outflow form the site from the implementation of onsite detention tanks. The onsite detention tanks have been designed accordance to Ku-ruing-gai Council requirements reducing the flow to 1 in 5 yrs ARI. It has been proposed that three Ceptors be installed to control the pollution from the developed area entering the downstream waterways.

3.10 Railway corridor

With the designed stormwater drainage there is no additional flow to the railway corridor. The flow discharged bellow the railway line will not be affected as there are no proposed blockages or backwater affects from the downstream condition. In the design it was assumed that the total flow upstream from the railway line will pass freely through the existing culvert bellow the railway line, therefore there will be no adverse affects to the railway corridor.

4. CONCLUSION AND RECOMMENDATIONS

Our stormwater study shows the following facts:

- There is a total upper catchment area of 4.6Ha entering the site.
- The total flow rate leaving the site through the existing pipe line and overland flow at the pre-development condition is in the order of 4.13m3/s.
- The impervious area from construction of the proposed building will be increased by 75%.To mitigate the potential stormwater impact, three underground detention storages compartments with a total volume of 589m3 have been proposed. The volume has been calculated as per Ku-ring-gai Council's Water Management development Control Plan-DCP47 rqruitments. This will reduce the total site run-off by 20% when comparing to the existing conditions.
- The total flow rate leaving the site incorporating the on-site detention system is reduced to 3.33m3/s at the post-development stage.
- The maximum 100-year ARI WSL along the proposed building varies between RL120.11 to RL133.61m AHD.
- The product of velocity and water depth will be improved in the post-development stage.
- This development will not adversely affect the water quality, provided that the specified water sensitive system is constructed.

The following items should be incorporated:

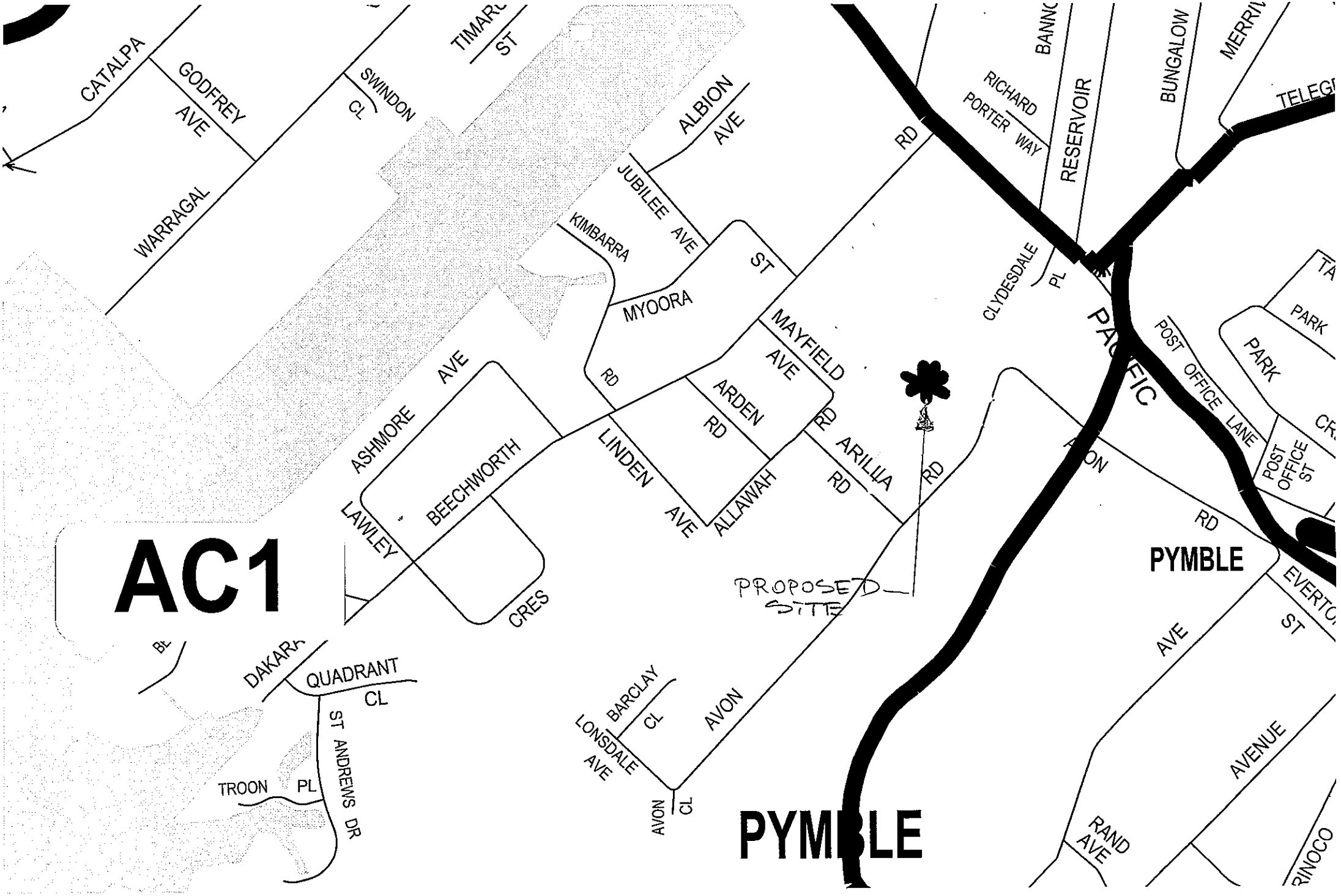
- No obstructions on the flooded part of the site,have been allowed for in the model except for the existing and proposed building as shown in **Attachment 7**.
- A minimum of 150mm gap below the fence must be maintained on the Eastern and Western boundary fence lines of the site to allow unobstructed lateral distribution of overland flow.
- The overland flow path must be clear of any obstruction. No solid fences have been allowed for in the model.
- With reshaping, the overland flow path water levels can be reduced as well the velocity x depth product.

LIST OF ATTACHMENTS

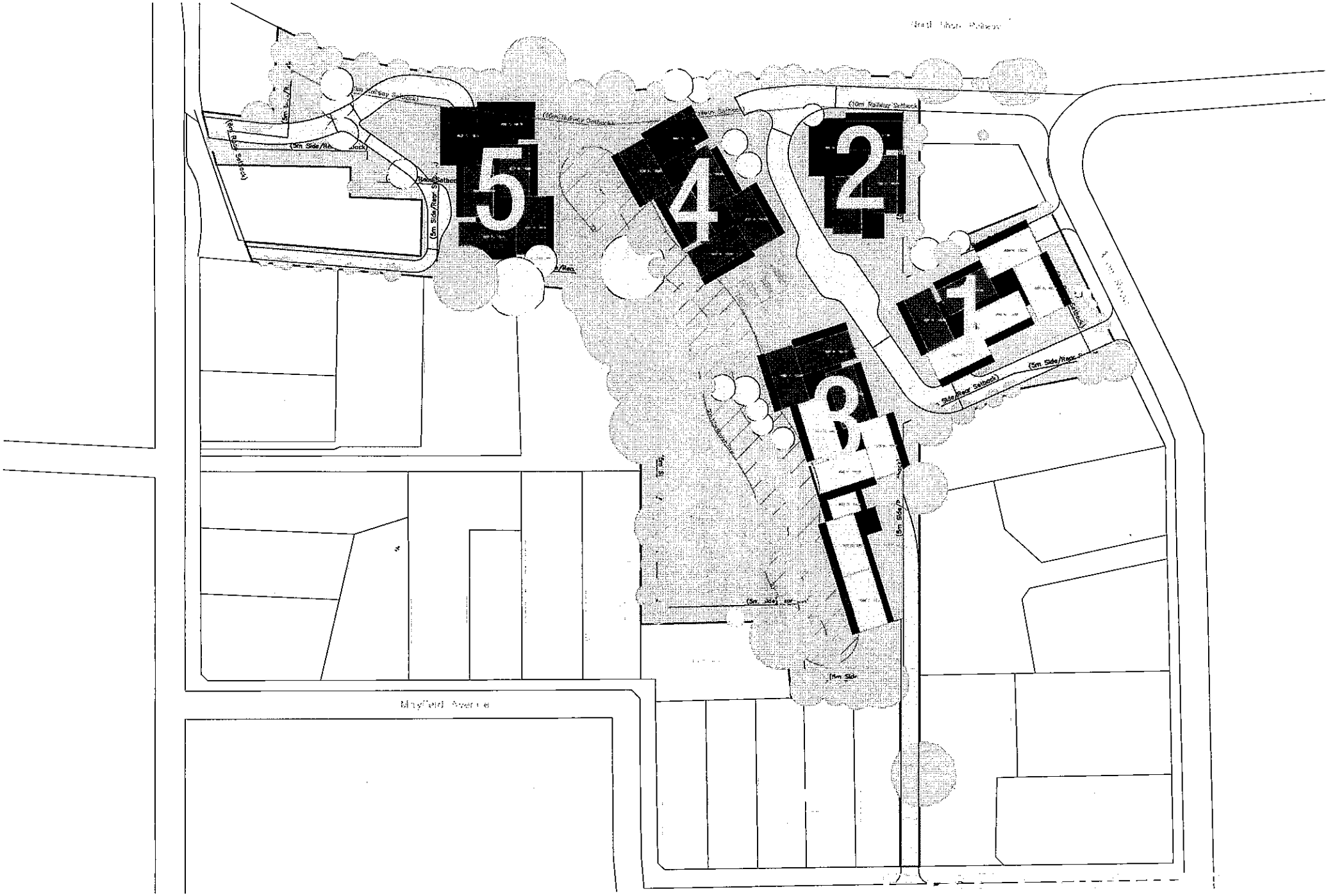
Attachment 1 – Locality Plan
Attachment 2 – Architectural Site Plan
Attachment 3 – Existing culvert – hydraulic detail
Attachment 4 – On-Site Detention Calculation Sheets
Attachment 5 – Catchment Plan and Drains model
Attachment 6 – Culvert/ Pipe Capacity Analysis
Attachment 7 – HEC-Ras Modelling Cross Section Lines

- HEC-Ras Modelling Results (Summary and Details)
- Scenario 1- Existing condition
- Scenario 2- Proposed condition

ATTACHMENT 1


AC1
PROPOSED SITE
PYMBLE
PYMBLE
CATALPA
GODFREY AVE
WARRAGAL
SWINDON CL
TIMARU ST
ALBION AVE
JUBILEE AVE
KIMBARRA
MYOORA ST
RD
MAYFIELD AVE
ARDEN RD
ALLAWAH
ARILLIA RD
LINDEN AVE
ASHMORE AVE
BEECHWORTH
LAWLEY
CRES
RICHARD PORTER WAY
RESERVOIR
BUNGALOW
CLYDESDALE PL
POST OFFICE LANE
POST OFFICE ST
PARK
PARK
AVON RD
AVE
AVENUE
RAND AVE
DAKARA
QUADRANT CL
ST ANDREWS DR
TROON PL
BARCLAY CL
LONSDALE AVE
AVON CL
AVON

ATTACHMENT 2


5
4
2
1
B
(5m Side/Rear Setback)
(10m Railway Setback)
Mayfield Avenue

ATTACHMENT 3

OPEN CHANNEL STEADY FLOW ANALYSIS

Q = V x A, where Q = Flowrate, V = Velocity, A = Section Area

Using Mannings Formula V = 1/n x R(2/3) x S(1/2)

where n = coefficent of roughness = 0.04 for stone pitched walls

R = Hydraulic radius = A/P = Area of the section / wetted perimeter of the section

S = Average slope in M/M, for this case is 5.6% or 0.058, S(1/2) = 0.241

For a trapazoidal section 1.2 M top, 1.0 M bottom, depth 0.8 M , A = 0.88 M2, P = 2.6 M

Flowrate = 2.57 M3/sec greater than 2.36 M3/sec for 1 in 100yr flood event, use SECTION

CALCULATION

A =	0.88
P =	2.6
R =	0.338462
R(2/3) =	0.485
S(1/2) =	0.241
n =	0.04
V =	2.92
Q =	2.5696

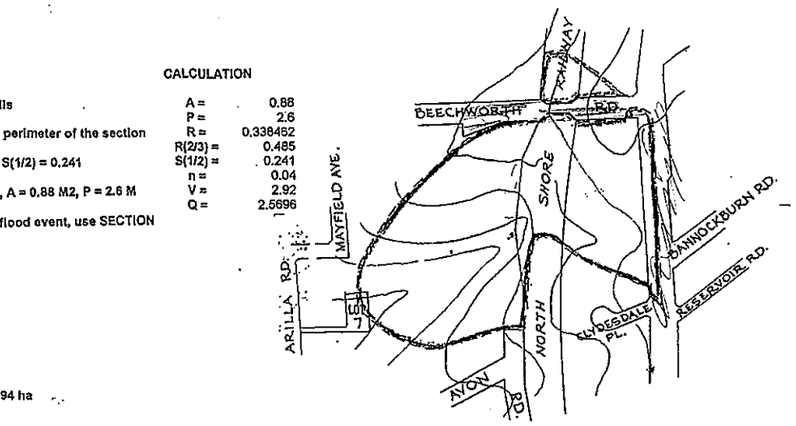
ON-SITE DETENTION STORAGE VOLUME

Council Requires 398 M3/ha and PSD 102ltr/sec

Site Area = 990.7 M2 = 0.09907 ha @ 60% development = 0.0594 ha

OSD = 398 x 0.0594 = 23.65 M3

Orifice diameter = 70mm



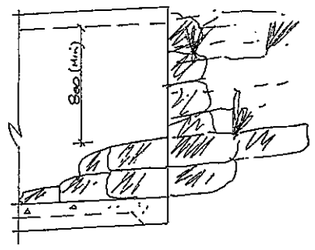
CATCHMENT ANALYSIS

Area of Catchment = A = 5.63 hectares

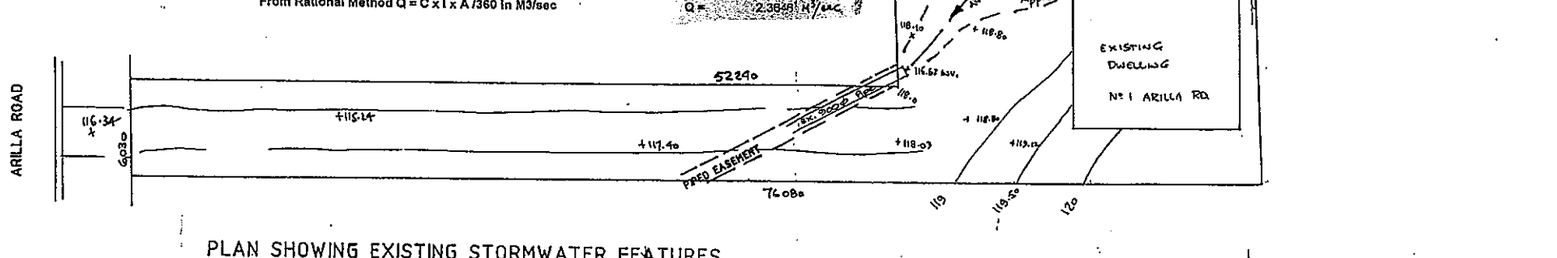
ARI 100yr = I = 168 mm/hr, Coefficient of runoff = C = 0.9

From Rational Method Q = C x I x A /360 in M3/sec

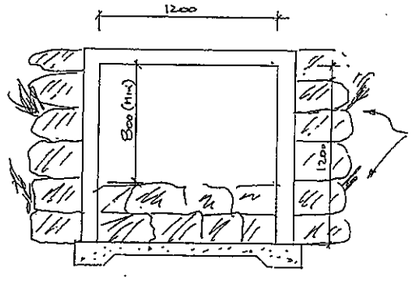
A =	5.63
I =	168
C =	0.9
Q =	2.3688 M3/sec



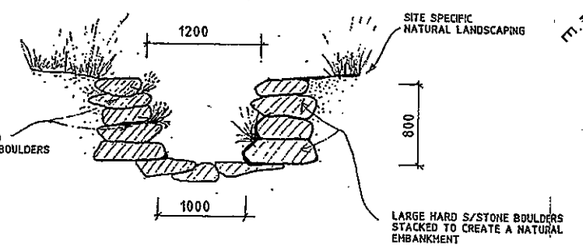
TYPICAL CONNECTION TO BOX CULVERT
1 : 20



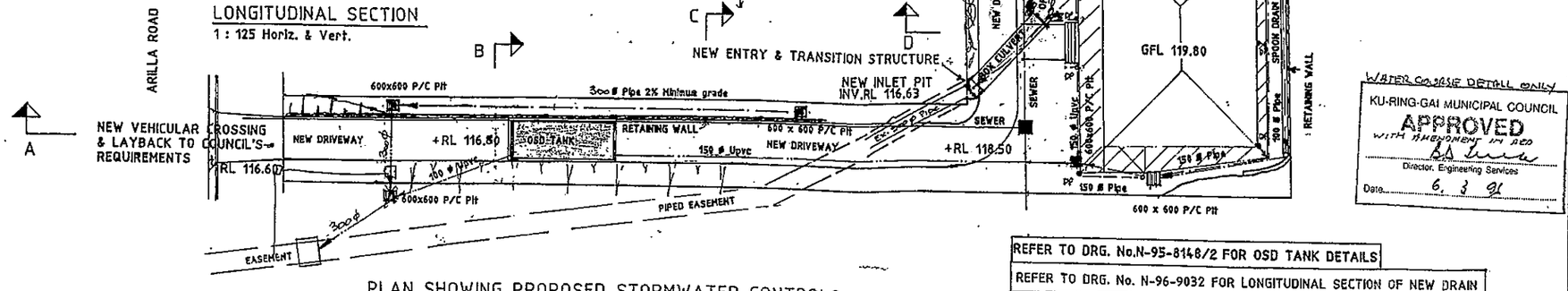
PLAN SHOWING EXISTING STORMWATER FEATURES
1 : 200



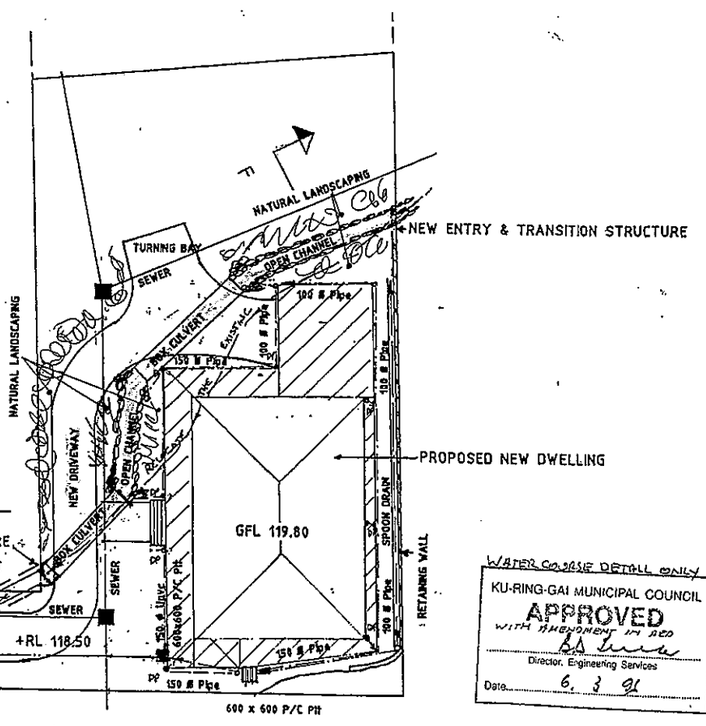
TYPICAL BOX CULVERT
1 : 20



TYPICAL OPEN DRAINAGE CHANNEL
NTS



PLAN SHOWING PROPOSED STORMWATER CONTROLS
1 : 200



REFER TO DRG. No.N-95-8148/2 FOR OSD TANK DETAILS

REFER TO DRG. No. N-96-9032 FOR LONGITUDINAL SECTION OF NEW DRAIN

REFER TO DRG. No. N-95-8148/1 FOR SECTIONS

WATER COURSE DETAIL ONLY

KU-RING-GAI MUNICIPAL COUNCIL
APPROVED
WITH AMENDMENT IN RED
Director, Engineering Services
Date 6.3.96

GENERAL

G1. All workmanship and materials to be in accordance with the requirements of current SAA codes, by-laws and ordinances laid down by the relevant Building Authority. This design will need to be approved by the relevant Building Authority.

G2. Do not scale from this drawing. All discussions shall be checked and verified by on-site measurement. Any discrepancies greater than 1% shall be brought to the attention of the Engineer immediately.

G3. All work shall be carried out by a competent, licensed Contractor or Sub-Contractor who will have been experienced in the field of construction.

FOUNDATIONS

F1. The Foundation material shall be uniform throughout and shall be classified in accordance with AS 2870 - 1988.
"SOIL CLASSIFICATION" ASSUMED: Stiff firm clay
Minimum Safe Bearing Capacity 100 kpa

F2. Any variation in foundation Conditions or materials from that assumed shall be referred to the Engineer immediately.

F3. Any excavation within 2m of any existing structure shall be referred to the Engineer prior to commencing. Upon the Engineers inspection, the Engineer will make recommendations for Underpinning or shoring or authorise proceeding without the necessity to underpin or shore up, but under no circumstances is the Contractor to proceed without giving due and proper notice.

REINFORCED CONCRETE:

C1. All workmanship and materials shall be in accordance with AS 1480 current edition with amendments, except where varied by the contract documents.

C2.

Element	Slump mm	Max Size Agg mm	Cement Type	f'c at 28 days MPa	Admixture
All	80	20	Normal Portland Cement	25	

C3. Minimum clear concrete cover to reinforcement including ties and stirrups shall be as follows unless otherwise shown.

Element	Cast against forms complying with current SAA Code		No formwork mm
	In sheltered location mm	Exposed to ground or weather mm	
Pad footing	-	65	75
Strip footings		50	65
Columns	40	50	75
Walls	20	30	65
Beams	25	40	65
Slabs	20	30	65

C4. Cover to reinforcement shall be obtained by the use of approved bar chairs. All chairs to be spaced at 750 crs maximum.

C5. All concrete shall be mechanically vibrated. Vibrators shall not be used to spread concrete.

C6. Sizes of concrete elements do not include thickness of applied finishes.

C7. Beam depths are taken first and include slab thickness.

C8. No holes or chases other than those shown on the structural drawings shall be made in concrete members without the prior approval of the engineer.

C9. Construction joints where not shown shall be located to the approval of the engineer. All construction joints shall be scabbled over the whole face and any unsound material removed.

C10. Reinforcement is represented diagrammatically; it is not necessarily shown in true projection.

C11. Splices in reinforcement shall be made only in the positions shown unless the approval of the engineer is obtained for any other splice.

C12. Welding of reinforcement will not be permitted unless shown on the structural drawings.

C13. Pipes or conduits shall not be placed within the concrete cover to reinforcement without the approval of the engineer. 'Plumbing penetrations permitted.

C14. Reinforcement symbols
S Denotes Grade 230S hot rolled deformed bars to AS 1302.
C Denotes Grade 410C cold worked deformed bars to AS 1302.
R Denotes Grade 230R hot rolled plain bars to AS1302.
Y Denotes Grade 410Y high yield strength deformed bars to AS1302.

The number preceding the above symbols denotes the number of bars in the group.
The number following the above symbols denotes the number of millimetres in the bar diameter.
F Denotes hard-drawn wire reinforcing fabric to AS 1304.
W Denotes hard-drawn plain wire to AS 1302.

C15. All reinforcing fabric shall comply with AS 1304 and AS 1303 and shall be supplied in flat sheets.

C16. All fabric for slabs poured on ground must be in place before concreting commences and shall be supported on bar chairs in accordance with note C4 above, seated on tin lids.

BRICKWORK: N.A.

B1. All bricks shall conform to the requirements of AS A21 and department of local government (NSW) standard specification No. 13.

B2. All brickwork shall be constructed in accordance with the current relevant SAA code.

B3. The design strength of brickwork shall be:

Element	Brick Compressive Strength	Mortar Mix		
		Cement Lime, Sand	f'c MPa	Admixtures

B4. Where brickwork supports concrete slabs the top course shall be laid lugs down and covered with 2 layers of Alkor or equal unless otherwise shown.

B5. Where walls are not load-bearing, they shall be separated from the concrete above by 20mm of Cooltex or equal.

B6. All brickwork built off slabs shall bear on 1 layer Alkor or equal

B7. All steel lintels to be hot dipped galvanised with 150 mm minimum bearing at each end

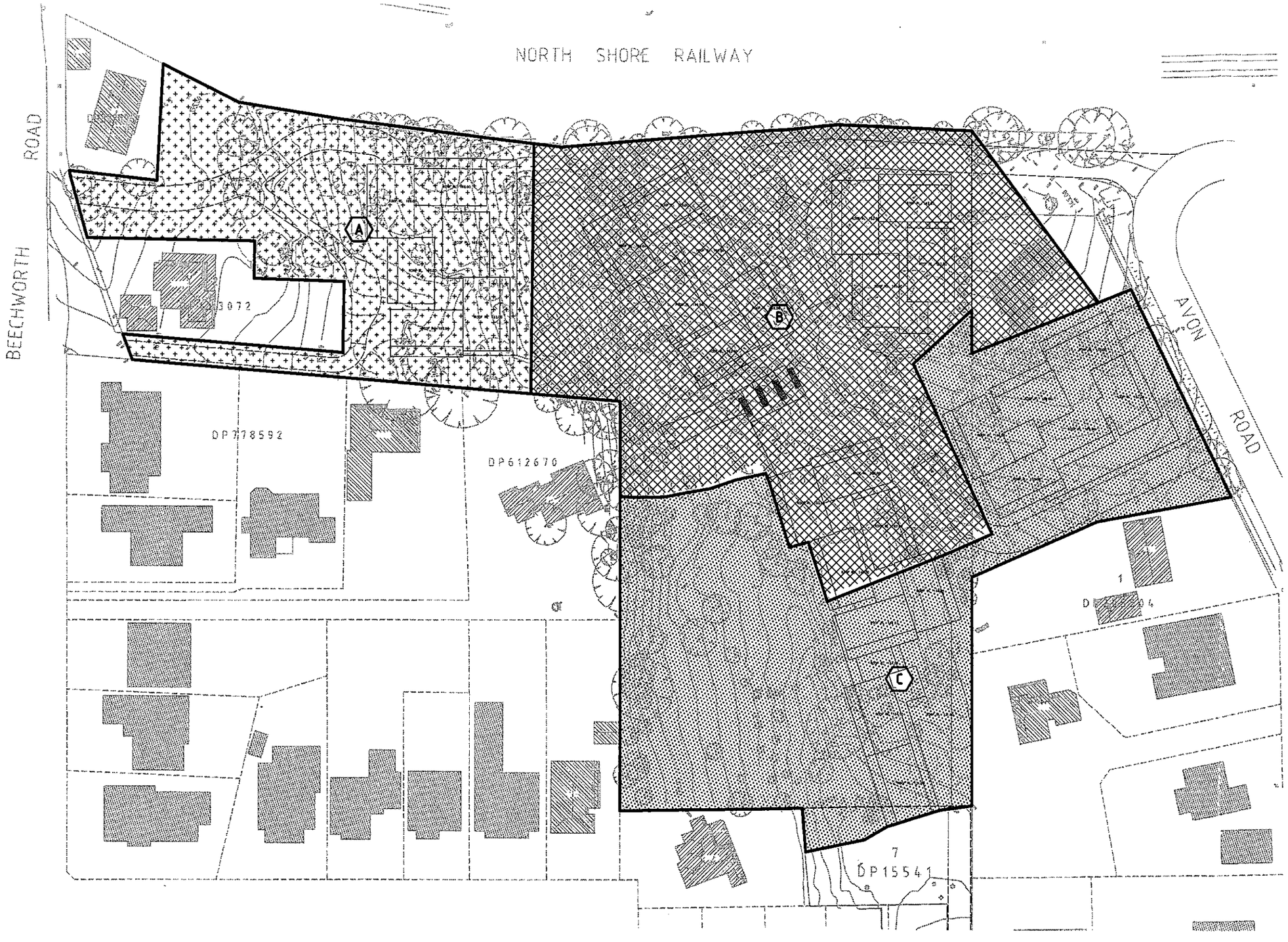
CLIENT: MR. & MRS. D. NEALE

TED BENNETT & ASSOCIATES
CONSULTING STRUCTURAL & CIVIL ENGINEERS
3 WANNITI ROAD, BELROSE 2085
Mobile: (018) 279 738
Phone: 975 3899

HYDRAULIC DETAILS - NEW DWELLING AT
1 ARILLA ROAD PYMBLE

SCALES	As shown	DRAWING NUMBER
DRAWN	EAB	N-95-8148/B
CHECKED		
DATE	11-11-95	

ATTACHMENT 4



CATCHMENT AREA		
TANK NO.	PATTERN	TOTAL AREA (ha)
A		0.525
B		1, 034
C		0.910

STORMWATER CATCHMENT AREA FOR ON-SITE DETENTION STORAGE PLAN

SCALE = 1:500

NOT TO BE USED FOR CONSTRUCTION PURPOSES

ISSUE	NOTES	DATE
01	PRELIMINARY ISSUE.	11/11/09

SCALES 1:1 1:2 1:5

KEY PLAN

ARCHITECT
Ancher/Mortlock/Woolley
Architecture, Planning, Urban Design, Interiors
Suite C3.10, Level 3, 22-36 Mountain Street,
Ultimo NSW 2007, Australia
T + 61 2 9280 2445 F + 61 2 9280 2446
E amw@amwarchitects.com.au
Nominated Architects: Dale Swan Cert. No. 3316.
Phil Baigent Cert. No. 6174

MYD Consulting Engineers Pty Ltd
Level 1,
280 Victoria Road
Gladesville, NSW 2111
Tel: 02 9817 2011
Fax: 02 9817 2033
Email: info@mydconsulting.com
www.mydconsulting.com
Structural
Civil
Stormwater
Telecommunications

CLIENT
JIM NEALE

PROJECT: RESIDENCE DEVELOPMENT AVON ROAD PYMBLE	NUMBER IN SET	JOB NO: P1544	
	SCALE: AS NOTED	SHEET NUMBER: SW-06	
DRAWING TITLE: STORMWATER CATCHMENT AREA FOR ON-SITE DETENTION STORAGE PLAN	DESIGN: D.D.	CHECK: P.M.	REV: 01
	DRAWN: V.C.	DATE: 11/11/09	

On-Site Detention Calculation Sheet

Address:

OSD A

Catchment Details

	AC1
Catchment Design Rate	0.0102 l/s/m2
Catchment Storage Rate	0.0398 l/s/m2

Site Details

Site Area m/2	5253 m2	60% of site area	3151.8 m2
Area (s) not draining to detention system	0 m2		
Tot Imp area (foofs, driveways, paving etc)	5253 m2		
Impervious area bypassing detention system	0 m2		

Permitted Site Discharge PSD

Flow 1	32.1 l/s
Adjustment for any uncontroled Imp flow	0 <0.25
Flow 2	0 l/s
PSD	**32.1 l/s**

Site Storage Requirements

SSR1	125 m3
Storage in Lanscape area	no
SSR2	m3

Outlet Control

Height different between top water level and centre of the orifice 1.5 m

D orifice	112 mm

On-Site Detention Calculation Sheet

Address:

OSD B

Catchment Details

AC1	
Catchment Design Rate	0.0102 l/s/m2
Catchment Storage Rate	0.0398 l/s/m2

Site Details

Site Area m/2	10340 m2	60% of site area	6204 m2
Area (s) not draining to detention system	2000 m2		
Tot Imp area (foofs, driveways, paving etc)	8340 m2		
Impervious area bypassing detention system	0 m2		

Permitted Site Discharge PSD

Flow 1	63.3 l/s
Adjustment for any uncontroled Imp flow	0 <0.25
Flow 2	0 l/s
PSD	**63.3 l/s**

Site Storage Requirements

SSR1	247 m3
Storage in Lanscape area	no
SSR2	m3

Outlet Control

Height different between top water level and centre of the orifice 5 m

D orifice	116.5 mm

On-Site Detention Calculation Sheet

Address:

OSD C

Catchment Details

AC1	
Catchment Design Rate	0.0102 l/s/m2
Catchment Storage Rate	0.0398 l/s/m2

Site Details

Site Area m/2	9099 m2	60% of site area	5459.4 m2
Area (s) not draining to detention system	4448 m2		
Tot Imp area (foofs, driveways, paving etc)	4651 m2		
Impervious area bypassing detention system	0 m2		

Permitted Site Discharge PSD

Flow 1	55.7 l/s
Adjustment for any uncontroled Imp flow	0 <0.25
Flow 2	0 l/s
PSD	**55.7 l/s**

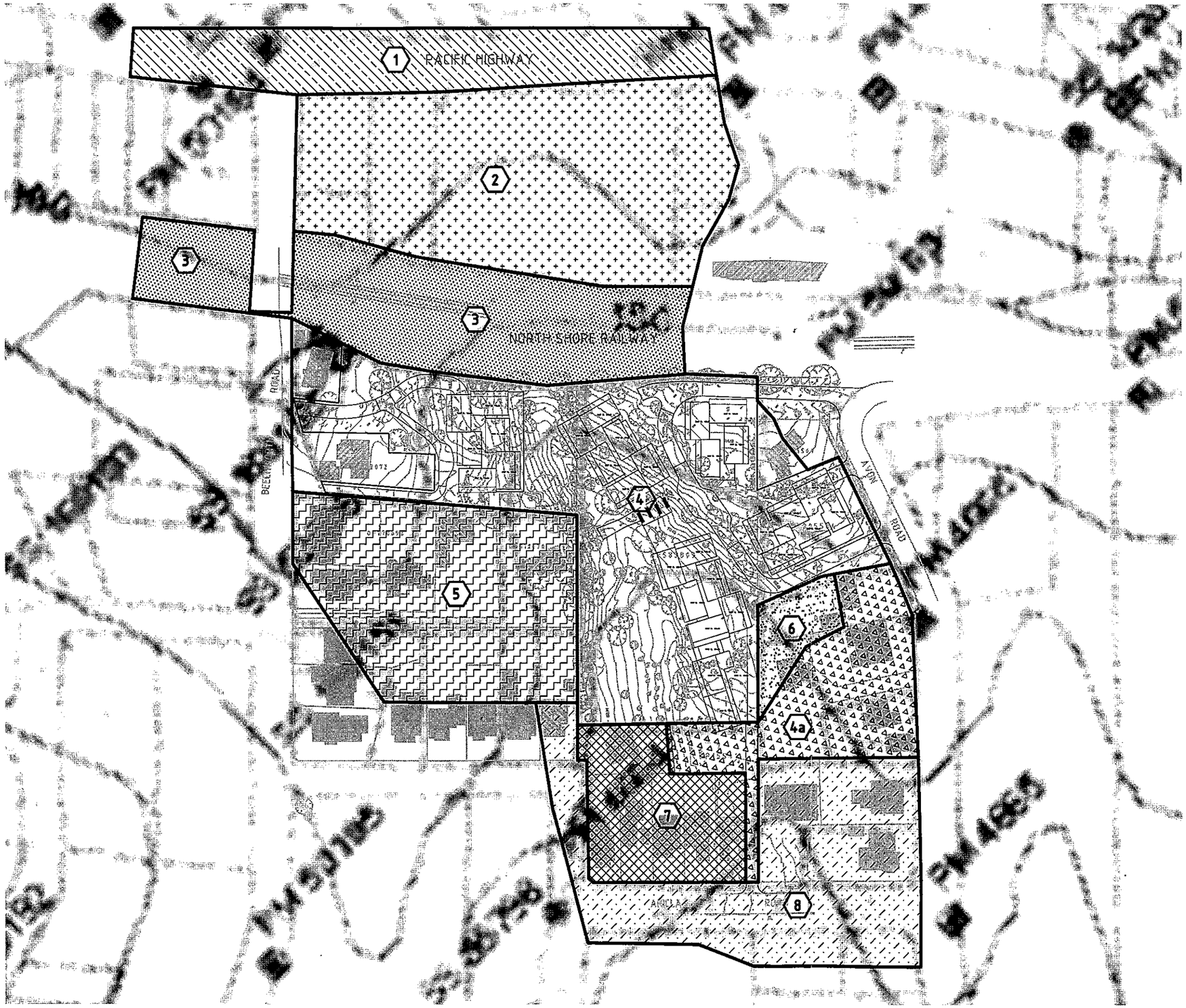
Site Storage Requirements

SSR1	217 m3
Storage in Lanscape area	no
SSR2	m3

Outlet Control

Height different between top water level and centre of the orifice	1.5 m
D orifice	148 mm

ATTACHMENT 5



SITE ANALYSIS

CATCHMENT NO.	PATTERN	TOTAL AREA (ha)
CATCHMENT 1		0.765
CATCHMENT 2		1, 724
CATCHMENT 3		1, 140
CATCHMENT 4		2, 670
CATCHMENT 4a		0.622
CATCHMENT 5		1.146
CATCHMENT 6		0.146
CATCHMENT 7		0.487
CATCHMENT 8		1, 160

STORMWATER SUB-CATCHMENT PLAN

SCALE = 1:1000

NOT TO BE USED FOR CONSTRUCTION PURPOSES

ISSUE	NOTES	DATE
01	PRELIMINARY ISSUE.	11/11/09

SCALES 1:1 1:2 1:5

KEY PLAN

ARCHITECT
Ancher/Mortlock/Woolley
Architecture, Planning, Urban Design, Interiors
Suite C3.18, Level 3, 22-36 Mountain Street,
Ultimo NSW 2007 Australia
T + 61 2 9288 2445 F + 61 2 9288 2446
E aaw@aawarchitects.com.au
Nominated Architects: Dale Swan Cert. No. 3316.
Phil Belgant Cert. No. 6174

Structural
CMI
Stormwater
Telecommunications

MYD Consulting Engineers Pty Ltd
Level 1,
280 Victoria Road
Gladesville, NSW 2111
Tel: 02 9817 2611
Fax: 02 9817 2688
Email: info@mydconsulting.com
www.mydconsulting.com

CLIENT
JIM NEALE

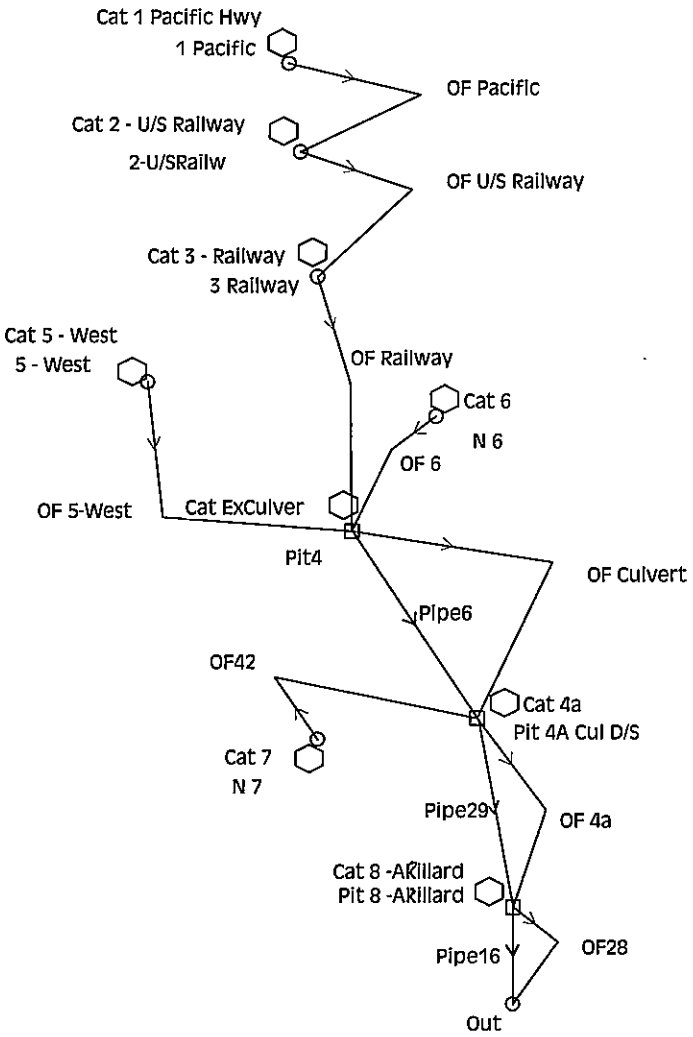
PROJECT
RESIDENCE DEVELOPMENT AVON ROAD
PYMBLE

DRAWING TITLE
STORMWATER
SUB-CATCHMENT PLAN

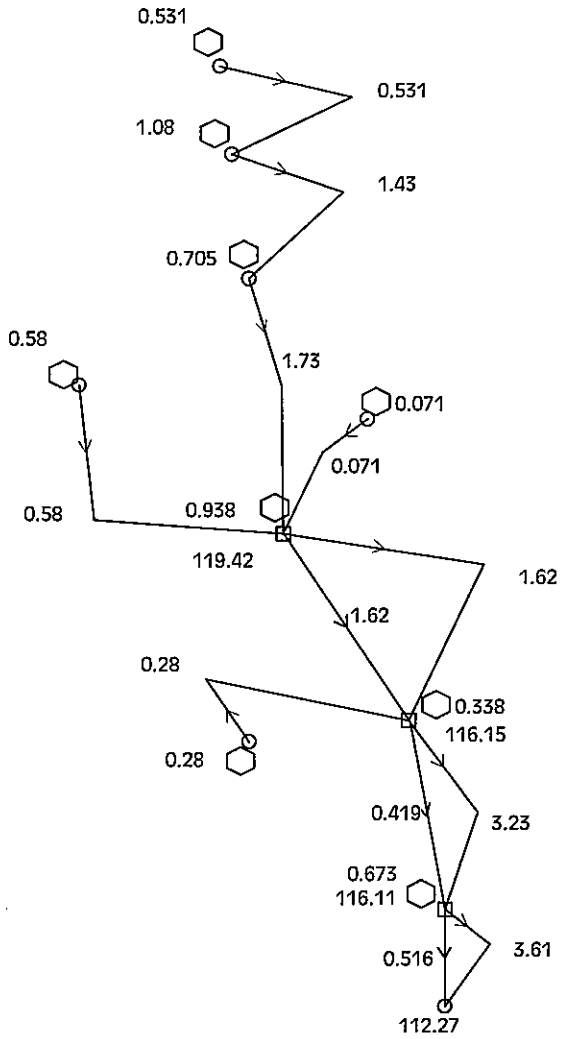
NUMBER IN SET	JOB NO P1544
SCALE AS NOTED	SHEET NUMBER SW-05
DESIGN D.D.	CHECK P.M. REV. 01
DRAWN V.C.	DATE 11/11/09

DUE TO LIMITS OF PRINTING EQUIPMENT

A1 DWG SHEET



Avon Road, Pymble
Existing Conditions
Flow Analysis - 100yr ARI



Avon Road, Pymble
Existing Conditions
Flow Analysis - 100yr ARI

AVON ROAD, PYMBLE

PIT / NODE DETAILS

Name	Type	Family	Version 9 Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part F Shocl
2-U/SRailw	Node					152		0		1054.913	-540.94		36	
1 Pacific	Node					155		0		1044.833	-467.5		39	
3 Railway	Node					140		0		1069.313	-644.62		56	
5 - West	Node					130		0		928.048	-732.784		64	
Pit4	OnGrade	New	Max inlet		1.5	119.65		0	0.5	1098.968	-857.038	No	119	1 x Ku
Pit 4A Cul I	OnGrade	New	Max inlet		4	116.15		0	0.5	1204	-1013.2	No	226177	1 x Ku
Pit 8 -Akilla	Sag	Sutherland	Grated pit \	100	5	116.42	0.3	0	0.5	1234	-1169.2	No	85	1 x Ku
Out	Node					115		0		1233.904	-1249.456		97	
N 7	Node					178		0		1069.6	-1030		226196	
N 6	Node					130		0		1170	-762		226206	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %
Cat 2 - U/S	2-U/SRailw	1.7237	85	15	0	6	9	0						
Cat 1 Pacif	1 Pacific	0.7648	93	7	0	5	6	0						
Cat 3 - Rai	3 Railway	1.1393	80	20	0	6	9	0						
Cat 5 - We	5 - West	1.146	20	80	0	5	12	0						
Cat ExCulv	Pit4	2.668	3	97	0	5	25	0						
Cat 4a	Pit 4A Cul I	0.6215	20	80	0	5	10	0						
Cat 8 -Akill	Pit 8 -Akilla	1.16	65	35	0	6	12	0						
Cat 7	N 7	0.487	40	60	0	5	10	0						
Cat 6	N 6	0.1465	10	90	0	5	12	0						

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg Fron	At Ch
Pipe6	Pit4	Pit 4A Cul I	81	118.45	115	4.26	Box Culver	1.2W x 0.7H		0.012	Existing	1	Pit4	0
Pipe29	Pit 4A Cul I	Pit 8 -Akilla	25	115	114.75	1	Box Culver	1.2W x 0.7H		0.012	Existing	1	Pit 4A Cu	0
Pipe16	Pit 8 -Akilla	Out	15	113	112	6.67	Concrete, c	450	450	0.013	Existing	1	Pit 8 -Akil	0

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storm (m)	Safe Depth Minor Storm (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF U/S Ra	2-U/SRailw	3 Railway	6				Dummy us	0.2	0.05	0.6	1	0	50
OF Pacific	1 Pacific	2-U/SRailw	6				Dummy us	0.2	0.05	0.6	1	0	49
OF Railway	3 Railway	Pit4	3				Dummy us	0.2	0.05	0.6	1	0	79
OF 5-West	5 - West	Pit4	6				Dummy us	0.2	0.05	0.6	1	0	69
OF Culvert	Pit4	Pit 4A Cul I	0.5				Dummy us	0.2	0.05	0.6	1	0	100
OF 4a	Pit 4A Cul I	Pit 8 -Akilla	0.1				Dummy us	0.2	0.05	0.6	1	0	####
OF28	Pit 8 -Akilla	Out	0.1				Dummy us	0.2	0.05	0.6	1	0	102
OF42	N 7	Pit 4A Cul I	0.3				Dummy us	0.2	0.05	0.6	1	0	####
OF 6	N 6	Pit4	0.3				Dummy us	0.2	0.05	0.6	1	0	####

AVON ROAD, PYMBLE

DRAINS results prepared 10 November, 2009 from Version 2008.07

PIT / NODE DETAILS Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit4	119.42		3.248		0.23	1.624	Inlet Capacity
Pit 4A Cul I	116.15		2.053		0	3.23	Outlet System
Pit 8 -Akilla	116.11	116.72	3.719	100	0.31	3.607	None
Out	112.27		3.607				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat 2 - U/S	1.083	0.963	0.145	6	9	0	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Cat 1 Pacif	0.531	0.499	0.032	5	6	0	AR&R 100 year, 1.5 hours storm, average 72 mm/h, Zone 1
Cat 3 - Rai	0.705	0.599	0.128	6	9	0	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Cat 5 - We	0.58	0.154	0.429	5	12	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat ExCulv	0.938	0.056	0.92	5	25	0	AR&R 100 year, 1.5 hours storm, average 72 mm/h, Zone 1
Cat 4a	0.338	0.083	0.255	5	10	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat 8 -Akill	0.673	0.484	0.19	6	12	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat 7	0.28	0.131	0.15	5	10	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat 6	0.071	0.01	0.064	5	12	0	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1

Outflow Volumes for Total Catchment (4.48 impervious + 5.37 pervious = 9.86 total ha)

Storm	Total Rainf	Total Runo	Impervious	Pervious Runoff
	cu.m	cu.m (Run	cu.m (Run	cu.m (Runoff %)
AR&R 100	2111	1476.29 (6	915.65 (95	560.64 (48.7%)
AR&R 100	3334.88	2601.05 (7	1472.52 (9	1128.53 (62.1%)
AR&R 100	4263.07	3448.80 (8	1894.84 (9	1553.95 (66.9%)
AR&R 100	4994.11	4110.07 (8	2227.47 (9	1882.60 (69.2%)
AR&R 100	5667.66	4701.81 (8	2533.93 (9	2167.87 (70.2%)
AR&R 100	6209.78	5177.37 (8	2780.60 (9	2396.77 (70.8%)
AR&R 100	7688.3	6492.70 (8	3453.33 (9	3039.37 (72.5%)
AR&R 100	8772.55	7446.89 (8	3946.65 (9	3500.24 (73.2%)
AR&R 100	10645.34	9105.01 (8	4798.77 (9	4306.25 (74.2%)
AR&R 100	12222.43	10498.03 (	5516.34 (9	4981.69 (74.8%)
AR&R 100	16263.72	14215.47 (	7355.15 (9	6860.32 (77.4%)

PIPE DETAILS

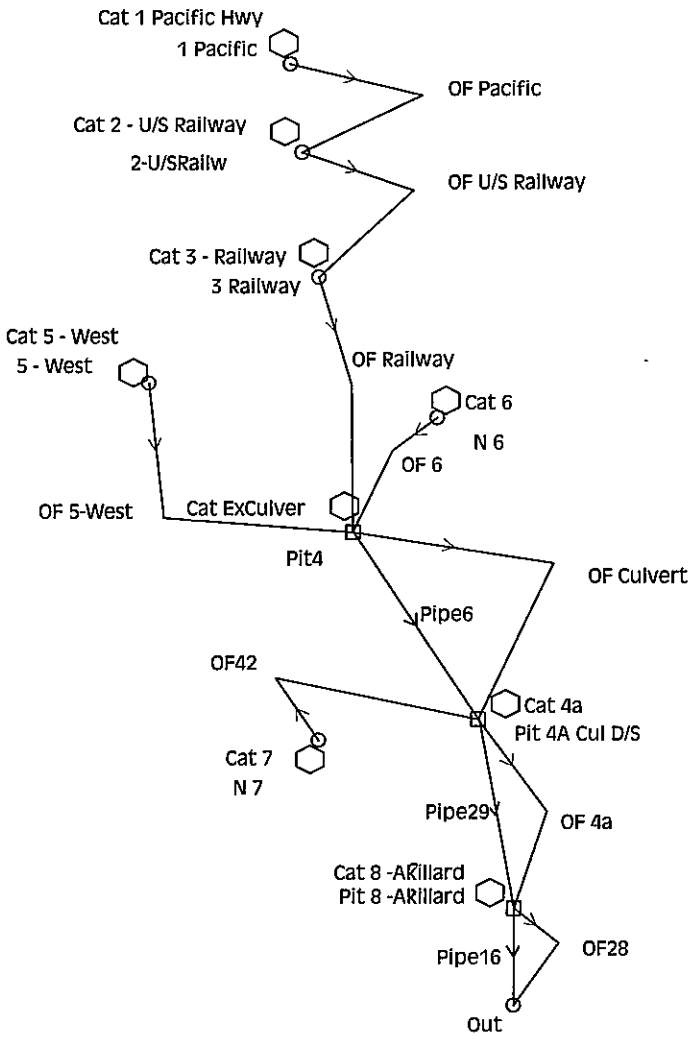
Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe6	1.624	5.4	118.699	116.15	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Pipe29	0.419	0.5	116.103	116.105	AR&R 100 year, 5 minutes storm, average 257 mm/h, Zone 1
Pipe16	0.516	5.1	113.275	112.275	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1

CHANNEL DETAILS

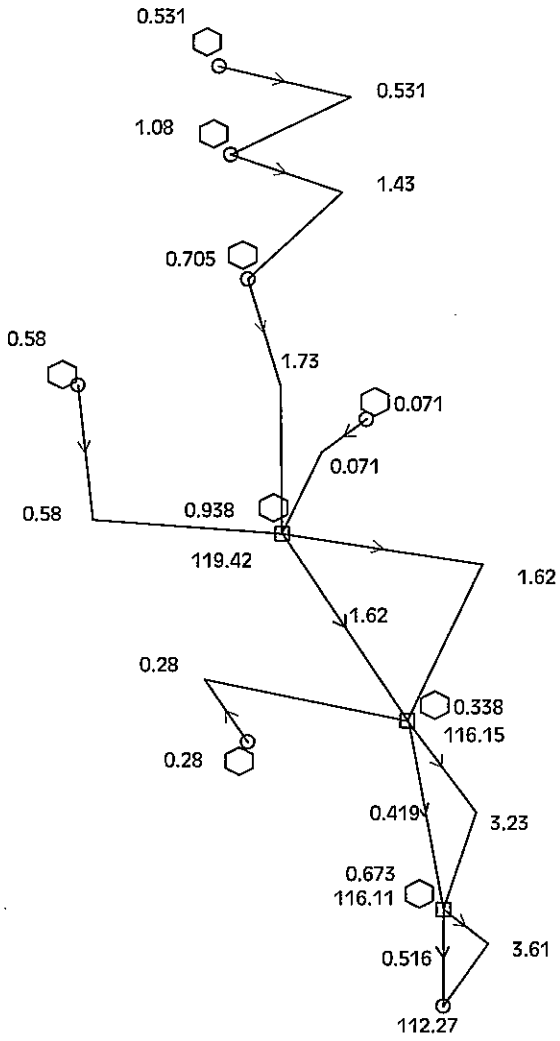
Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF U/S Ra	1.428	1.428	7.665	0.101	0.11	24.21	1.05	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
OF Pacific	0.531	0.531	7.665	0.067	0.05	17.38	0.81	AR&R 100 year, 1.5 hours storm, average 72 mm/h, Zone 1
OF Railway	1.734	1.734	7.665	0.109	0.12	25.82	1.11	AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1
OF 5-West	0.58	0.58	7.665	0.07	0.06	17.92	0.83	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
OF Culvert	1.624	1.624	7.665	0.106	0.12	25.28	1.08	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF 4a	3.23	3.23	7.665	0.141	0.18	32.11	1.3	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF28	3.607	3.607	7.665	0.148	0.2	33.55	1.33	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF42	0.28	0.28	7.665	0.052	0.04	14.33	0.68	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
OF 6	0.071	0.071	7.665	0.031	0.01	10.2	0.45	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1



Avon Road, Pymble
Existing Conditions
Flow Analysis - 100yr ARI



Avon Road, Pymble
Existing Conditions
Flow Analysis - 100yr ARI

AVON ROAD, PYMBLE

PIT / NODE DETAILS

Name	Type	Family	Version 9 Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part F Shocl
2-U/SRailw	Node					152		0		1054.913	-540.94		36	
1 Pacific	Node					155		0		1044.833	-467.5		39	
3 Railway	Node					140		0		1069.313	-644.62		56	
5 - West	Node					130		0		928.048	-732.784		64	
Pit4	OnGrade	New	Max inlet		1.5	119.65		0	0.5	1098.968	-857.038	No	119	1 x Ku
Pit 4A Cul I	OnGrade	New	Max inlet		4	116.15		0	0.5	1204	-1013.2	No	226177	1 x Ku
Pit 8 -Akilla	Sag	Sutherland	Grated pit \	100	5	116.42	0.3	0	0.5	1234	-1169.2	No	85	1 x Ku
Out	Node					115		0		1233.904	-1249.456		97	
N 7	Node					178		0		1069.6	-1030		226196	
N 6	Node					130		0		1170	-762		226206	

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Init Vol. (cu	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	Paved Area %	Grass Area %	Supp Area %	Paved Time (min)	Grass Time (min)	Supp Time (min)	Paved Length (m)	Grass Length (m)	Supp Length (m)	Paved Slope(%) %	Grass Slope %	Supp Slope %
Cat 2 - U/S	2-U/SRailw	1.7237	85	15	0	6	9	0						
Cat 1 Pacif	1 Pacific	0.7648	93	7	0	5	6	0						
Cat 3 - Rai	3 Railway	1.1393	80	20	0	6	9	0						
Cat 5 - We	5 - West	1.146	20	80	0	5	12	0						
Cat ExCulv	Pit4	2.668	3	97	0	5	25	0						
Cat 4a	Pit 4A Cul I	0.6215	20	80	0	5	10	0						
Cat 8 -Akill	Pit 8 -Akilla	1.16	65	35	0	6	12	0						
Cat 7	N 7	0.487	40	60	0	5	10	0						
Cat 6	N 6	0.1465	10	90	0	5	12	0						

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Ch
Pipe6	Pit4	Pit 4A Cul I	81	118.45	115	4.26	Box Culver	1.2W x 0.7H		0.012	Existing	1	Pit4	0
Pipe29	Pit 4A Cul I	Pit 8 -Akilla	25	115	114.75	1	Box Culver	1.2W x 0.7H		0.012	Existing	1	Pit 4A Cu	0
Pipe16	Pit 8 -Akilla	Out	15	113	112	6.67	Concrete, c	450	450	0.013	Existing	1	Pit 8 -Akil	0

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storm (m)	Safe Depth Minor Storm (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id
OF U/S Ra	2-U/SRailw	3 Railway	6				Dummy us	0.2	0.05	0.6	1	0	50
OF Pacific	1 Pacific	2-U/SRailw	6				Dummy us	0.2	0.05	0.6	1	0	49
OF Railway	3 Railway	Pit4	3				Dummy us	0.2	0.05	0.6	1	0	79
OF 5-West	5 - West	Pit4	6				Dummy us	0.2	0.05	0.6	1	0	69
OF Culvert	Pit4	Pit 4A Cul I	0.5				Dummy us	0.2	0.05	0.6	1	0	100
OF 4a	Pit 4A Cul I	Pit 8 -Akilla	0.1				Dummy us	0.2	0.05	0.6	1	0	####
OF28	Pit 8 -Akilla	Out	0.1				Dummy us	0.2	0.05	0.6	1	0	102
OF42	N 7	Pit 4A Cul I	0.3				Dummy us	0.2	0.05	0.6	1	0	####
OF 6	N 6	Pit4	0.3				Dummy us	0.2	0.05	0.6	1	0	####

AVON ROAD, PYMBLE

DRAINS results prepared 10 November, 2009 from Version 2008.07

PIT / NODE DETAILS Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Pit4	119.42		3.248		0.23	1.624	Inlet Capacity
Pit 4A Cul I	116.15		2.053		0	3.23	Outlet System
Pit 8 -Akille	116.11	116.72	3.719	100	0.31	3.607	None
Out	112.27		3.607				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	Paved Max Q (cu.m/s)	Grassed Max Q (cu.m/s)	Paved Tc (min)	Grassed Tc (min)	Supp. Tc (min)	Due to Storm
Cat 2 - U/S	1.083	0.963	0.145	6	9	0	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Cat 1 Pacif	0.531	0.499	0.032	5	6	0	AR&R 100 year, 1.5 hours storm, average 72 mm/h, Zone 1
Cat 3 - Rai	0.705	0.599	0.128	6	9	0	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Cat 5 - We	0.58	0.154	0.429	5	12	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat ExCulv	0.938	0.056	0.92	5	25	0	AR&R 100 year, 1.5 hours storm, average 72 mm/h, Zone 1
Cat 4a	0.338	0.083	0.255	5	10	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat 8 -Akill	0.673	0.484	0.19	6	12	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat 7	0.28	0.131	0.15	5	10	0	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
Cat 6	0.071	0.01	0.064	5	12	0	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1

Outflow Volumes for Total Catchment (4.48 impervious + 5.37 pervious = 9.86 total ha)

Storm	Total Rainf cu.m	Total Runo cu.m (Run	Impervious cu.m (Run	Pervious Runoff cu.m (Runoff %)
AR&R 100	2111	1476.29 (6	915.65 (95	560.64 (48.7%)
AR&R 100	3334.88	2601.05 (7	1472.52 (9	1128.53 (62.1%)
AR&R 100	4263.07	3448.80 (8	1894.84 (9	1553.95 (66.9%)
AR&R 100	4994.11	4110.07 (8	2227.47 (9	1882.60 (69.2%)
AR&R 100	5667.66	4701.81 (8	2533.93 (9	2167.87 (70.2%)
AR&R 100	6209.78	5177.37 (8	2780.60 (9	2396.77 (70.8%)
AR&R 100	7688.3	6492.70 (8	3453.33 (9	3039.37 (72.5%)
AR&R 100	8772.55	7446.89 (8	3946.65 (9	3500.24 (73.2%)
AR&R 100	10645.34	9105.01 (8	4798.77 (9	4306.25 (74.2%)
AR&R 100	12222.43	10498.03 (	5516.34 (9	4981.69 (74.8%)
AR&R 100	16263.72	14215.47 (	7355.15 (9	6860.32 (77.4%)

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe6	1.624	5.4	118.699	116.15	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
Pipe29	0.419	0.5	116.103	116.105	AR&R 100 year, 5 minutes storm, average 257 mm/h, Zone 1
Pipe16	0.516	5.1	113.275	112.275	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Chainage (m)	Max HGL (m)	Due to Storm

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF U/S Ra	1.428	1.428	7.665	0.101	0.11	24.21	1.05	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
OF Pacific	0.531	0.531	7.665	0.067	0.05	17.38	0.81	AR&R 100 year, 1.5 hours storm, average 72 mm/h, Zone 1
OF Railway	1.734	1.734	7.665	0.109	0.12	25.82	1.11	AR&R 100 year, 20 minutes storm, average 152 mm/h, Zone 1
OF 5-West	0.58	0.58	7.665	0.07	0.06	17.92	0.83	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
OF Culvert	1.624	1.624	7.665	0.106	0.12	25.28	1.08	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF 4a	3.23	3.23	7.665	0.141	0.18	32.11	1.3	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF28	3.607	3.607	7.665	0.148	0.2	33.55	1.33	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1
OF42	0.28	0.28	7.665	0.052	0.04	14.33	0.68	AR&R 100 year, 25 minutes storm, average 138 mm/h, Zone 1
OF 6	0.071	0.071	7.665	0.031	0.01	10.2	0.45	AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level

CONTINUITY CHECK for AR&R 100 year, 2 hours storm, average 62 mm/h, Zone 1

Node	Inflow (cu.m)	Outflow (cu.m)	Storage Ch (cu.m)	Difference %
2-U/SRailw	2967.45	2967.45	0	0
1 Pacific	924.73	924.73	0	0
3 Railway	4300.55	4300.54	0	0
5 - West	1133.99	1133.99	0	0
Pit4	8066.51	8066.52	0	0
Pit 4A Cul I	9193.26	9193.34	0	0
Pit 8 -Akilla	10498.06	10494.35	3.66	0
Out	10494.38	10494.38	0	0
N 7	511.39	511.39	0	0
N 6	140.56	140.56	0	0

Run Log for Avon Rd run at 17:54:15 on 10/11/2009

Upwelling occurred at Pit 4A Cul D/S

The following overflow routes carried water uphill (adding energy): OF 4a
These results may be invalid. You should check for water flowing round in circles at these locations. You may need to reformulate the model.

ATTACHMENT 6

CUL09

No. Culverts = 1 Entrance type = 3
Pipe culvert D = .9 (metres)

Elevation metres	Height metres	Culvert m3/s	Weir m3/s	Total m3/s
118.440	0.000	0.000	0.000	0.000
118.540	0.100	0.017	0.000	0.017
118.640	0.200	0.070	0.000	0.070
118.740	0.300	0.156	0.000	0.156
118.840	0.400	0.277	0.000	0.277
118.940	0.500	0.432	0.000	0.432
119.040	0.600	0.592	0.000	0.592
119.140	0.700	0.773	0.000	0.773
119.240	0.800	0.974	0.000	0.974
119.340	0.900	1.124	0.000	1.124
119.440	1.000	1.257	0.000	1.257
119.540	1.100	1.391	0.000	1.391
119.640	1.200	1.525	0.000	1.525

CULVQ

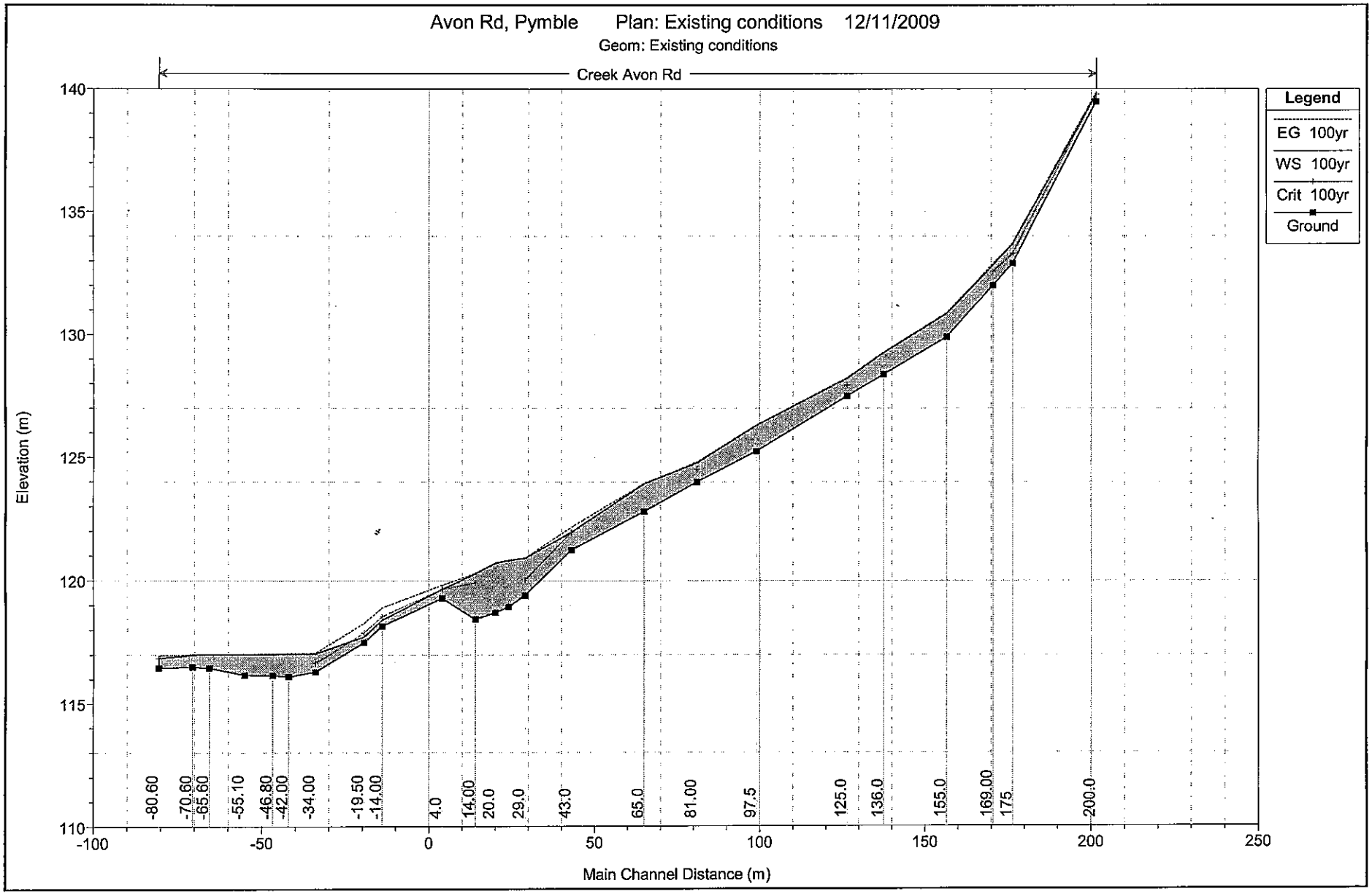
No. Culverts = 1 Entrance type = 3
Box culvert B = 1.2 D = .7 (metres)

Elevation metres	Height metres	Culvert m3/s	Weir m3/s	Total m3/s
118.440	0.000	0.000	0.000	0.000
118.540	0.100	0.072	0.000	0.072
118.640	0.200	0.190	0.000	0.190
118.740	0.300	0.335	0.000	0.335
118.840	0.400	0.500	0.000	0.500
118.940	0.500	0.683	0.000	0.683
119.040	0.600	0.880	0.000	0.880
119.140	0.700	1.091	0.000	1.091
119.240	0.800	1.272	0.000	1.272
119.340	0.900	1.419	0.000	1.419
119.440	1.000	1.565	0.000	1.565
119.540	1.100	1.710	0.000	1.710
119.640	1.200	1.854	0.000	1.854

ATTACHMENT 7

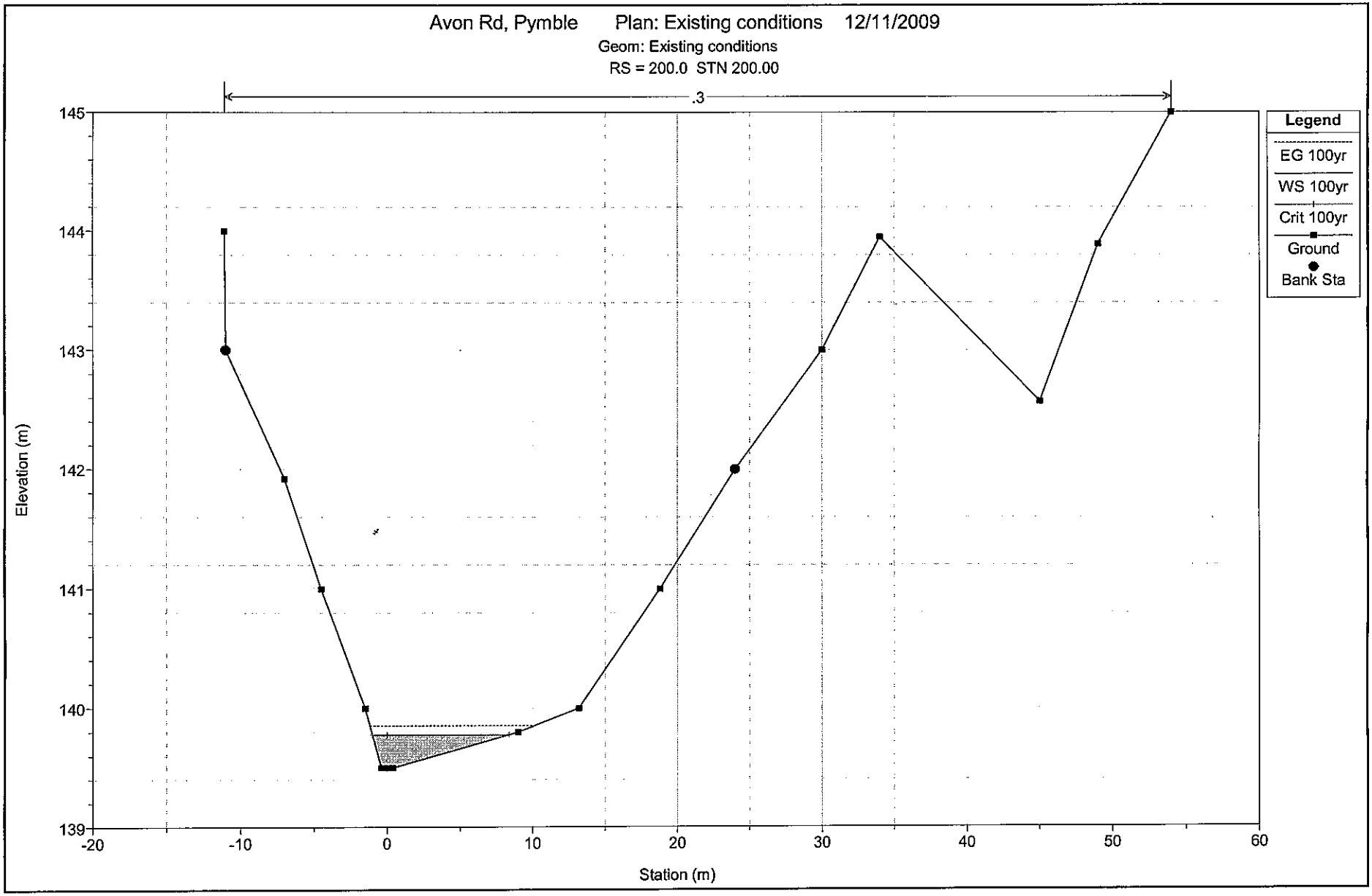
HEC-RAS Summary for Flood Study at Avon Road, Pymble

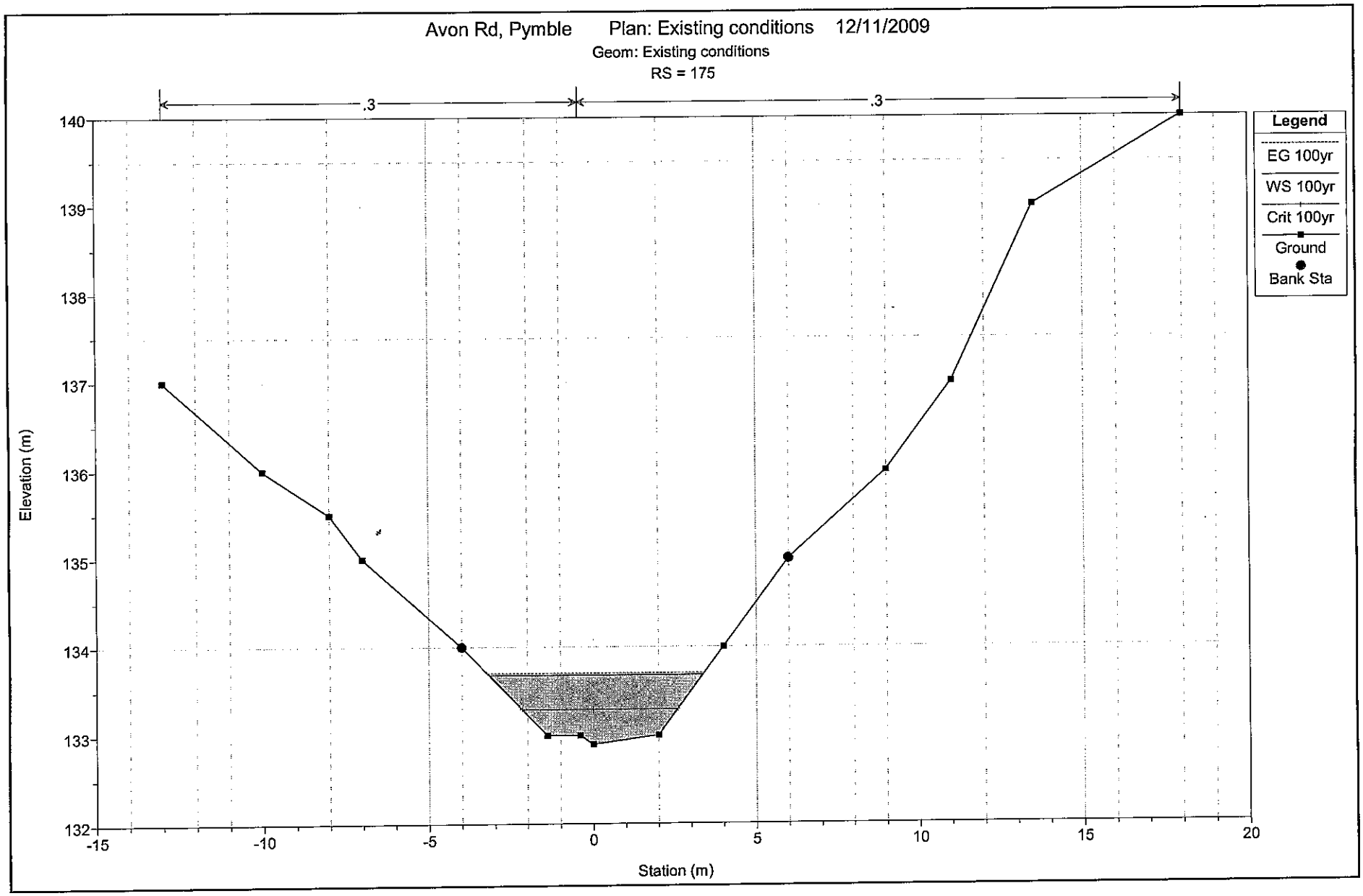
Reach	River Station	Q of	Min Ch El	Exisitng Condition				Increase WSL	Q of	Proposed Condition			
				W.S. Elev	Vel Chnl	Ch Depth	V Chnl x d			W.S. Elev	Vel Chnl	Ch Depth	V Chnl x d
		(m^3/s)	(m, AHD)	(m, AHD)	(m/s)	(m^2/s)	(m^2/s)		(m^3/s)	(m, AHD)	(m/s)	(m)	(m^2/s)
Avon Rd	200	1.73	139.50	139.78	1.23	0.28	0.3	0.00	1.73	139.78	1.23	0.28	0.3
Avon Rd	175	2.20	132.90	133.68	0.62	0.78	0.5	-0.07	1.76	133.61	0.58	0.71	0.4
Avon Rd	169	2.20	132.00	132.83	0.99	0.83	0.8	-0.11	1.76	132.72	0.99	0.72	0.7
Avon Rd	155	2.20	129.90	130.84	0.71	0.94	0.7	-0.08	1.76	130.76	0.64	0.86	0.6
Avon Rd	136	2.20	128.38	129.26	0.54	0.88	0.5	-0.09	1.76	129.17	0.53	0.79	0.4
Avon Rd	125	3.22	127.50	128.22	0.65	0.72	0.5	-0.07	2.41	128.15	0.57	0.65	0.4
Avon Rd	97.5	3.22	125.25	126.31	0.49	1.06	0.5	-0.14	2.41	126.17	0.48	0.92	0.4
Avon Rd	81	3.22	124.00	124.77	0.74	0.77	0.6	-0.02	2.41	124.75	0.59	0.75	0.4
Avon Rd	65	3.22	122.80	123.92	0.42	1.12	0.5	-0.23	2.41	123.69	0.46	0.89	0.4
Avon Rd	43	3.22	121.25	121.98	1.91	0.73	**1.4**	0.33	2.41	122.31	0.68	1.06	**0.7**
Avon Rd	29	3.22	119.41	120.91	0.41	1.50	0.6	-0.73	2.41	120.18	0.93	0.77	0.7
Avon Rd	24	3.22	118.95	120.83	0.39	1.88	0.7	-0.68	2.41	120.15	0.20	1.65	0.3
Avon Rd	20	3.22	118.72	120.71	0.62	1.99	1.2	-0.60	2.41	120.11	0.50	1.39	0.7
Avon Rd	14	2.47	118.44	120.30	0.49	1.86	0.9	-0.39	1.68	119.91	0.09	1.47	0.1
Avon Rd	4	2.38	119.30	119.66	1.84	0.36	0.7	-0.08	1.68	119.58	0.83	0.18	0.2
Avon Rd	-14	2.86	118.17	118.42	3.12	0.25	0.8	0.07	2.11	118.49	1.77	0.32	0.6
Avon Rd	-19.5	2.84	117.50	117.74	3.31	0.24	0.8	-0.08	2.11	117.66	3.58	0.16	0.6
Avon Rd	-34	2.88	116.30	117.06	0.62	0.76	0.5	-0.05	2.11	117.01	0.50	0.71	0.4
Avon Rd	-42	3.31	116.10	117.05	0.64	0.95	0.6	-0.06	2.64	116.99	0.54	0.89	0.5
Avon Rd	-46.8	3.34	116.16	117.03	0.64	0.87	0.6	-0.05	2.64	116.98	0.54	0.82	0.4
Avon Rd	-55.1	2.67	116.17	117.03	0.46	0.86	0.4	-0.05	2.64	116.98	0.40	0.81	0.3
Avon Rd	-65.6	1.53	116.47	117.02	0.46	0.55	0.3	-0.05	2.64	116.97	0.41	0.50	0.2
Avon Rd	-70.6	3.38	116.50	116.99	0.69	0.49	0.3	-0.04	2.64	116.95	0.64	0.45	0.3
Avon Rd	-80.6	3.38	116.47	116.86	1.40	0.39	0.6	-0.03	2.64	116.83	1.34	0.36	0.5

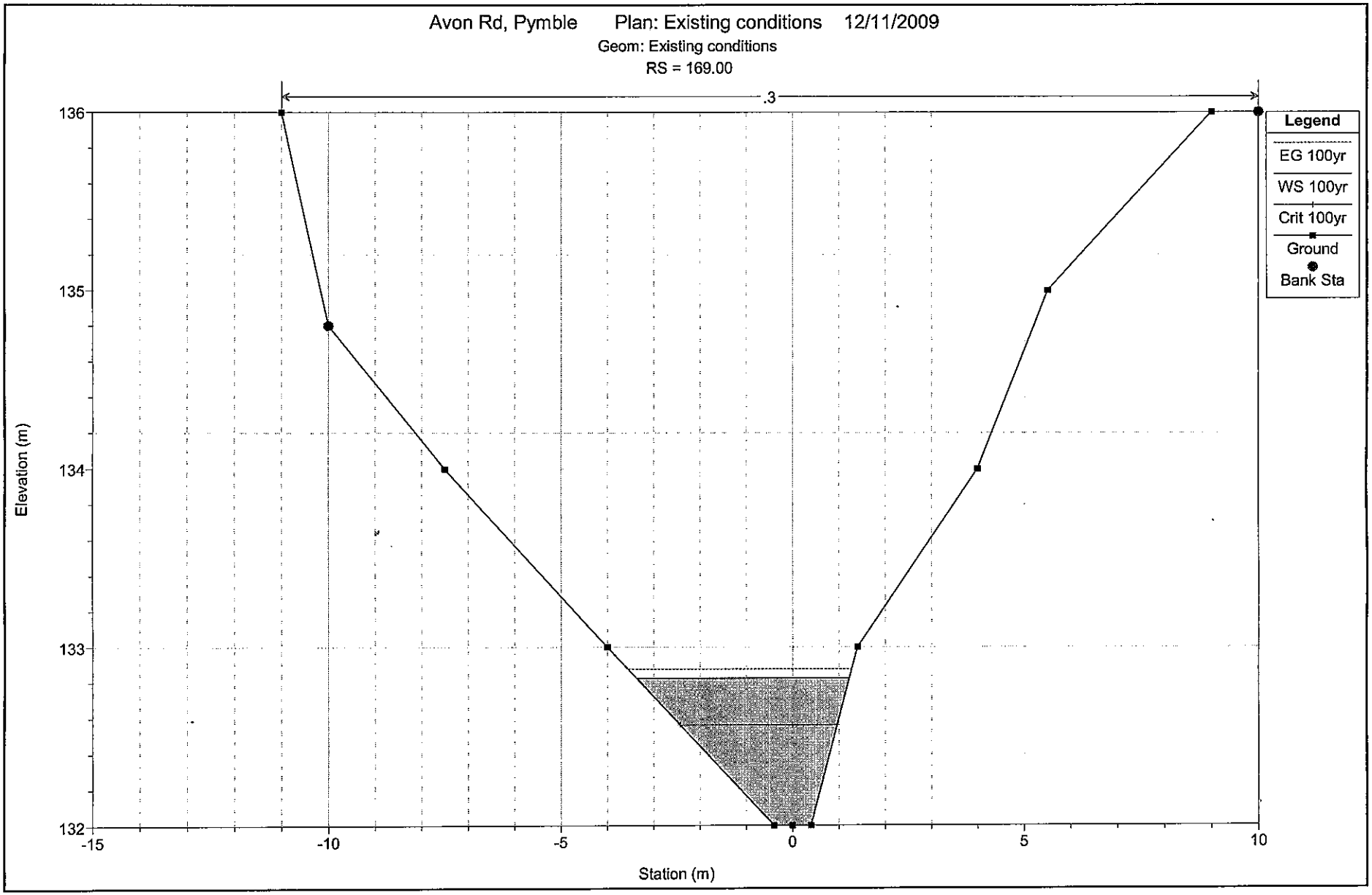

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
Creek Avon Rd
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Elevation (m)
Main Channel Distance (m)
140
135
130
125
120
115
110
-100
-50
0
50
100
150
200
250
-80.60
-70.60
-65.60
-55.10
-46.80
-42.00
-34.00
-19.50
-14.00
4.0
14.00
20.0
29.0
43.0
65.0
81.00
97.5
125.0
136.0
155.0
169.00
175
200.0

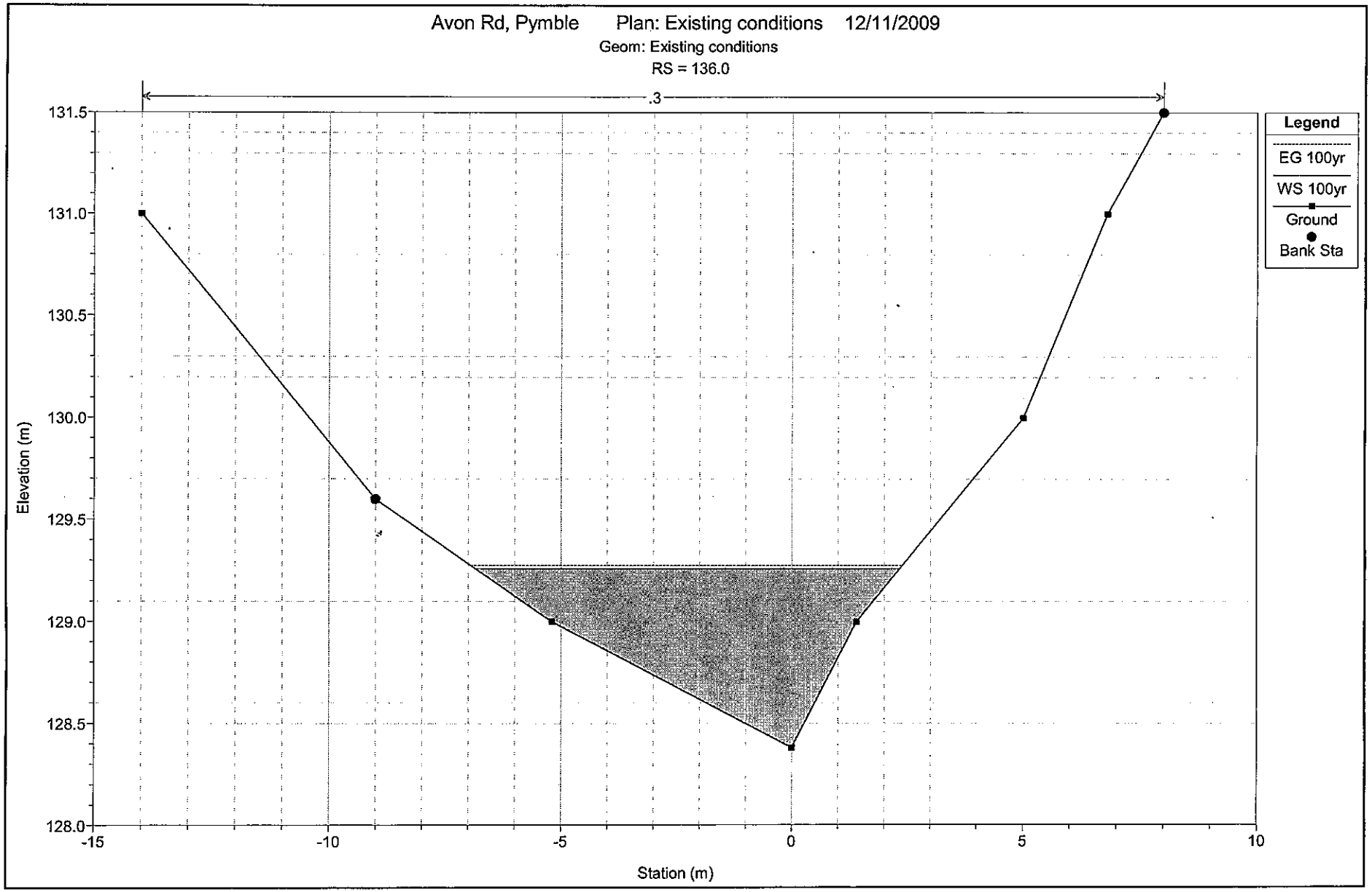
HEC-RAS Plan: ex cond River: Creek Reach: Avon Rd Profile: 100yr

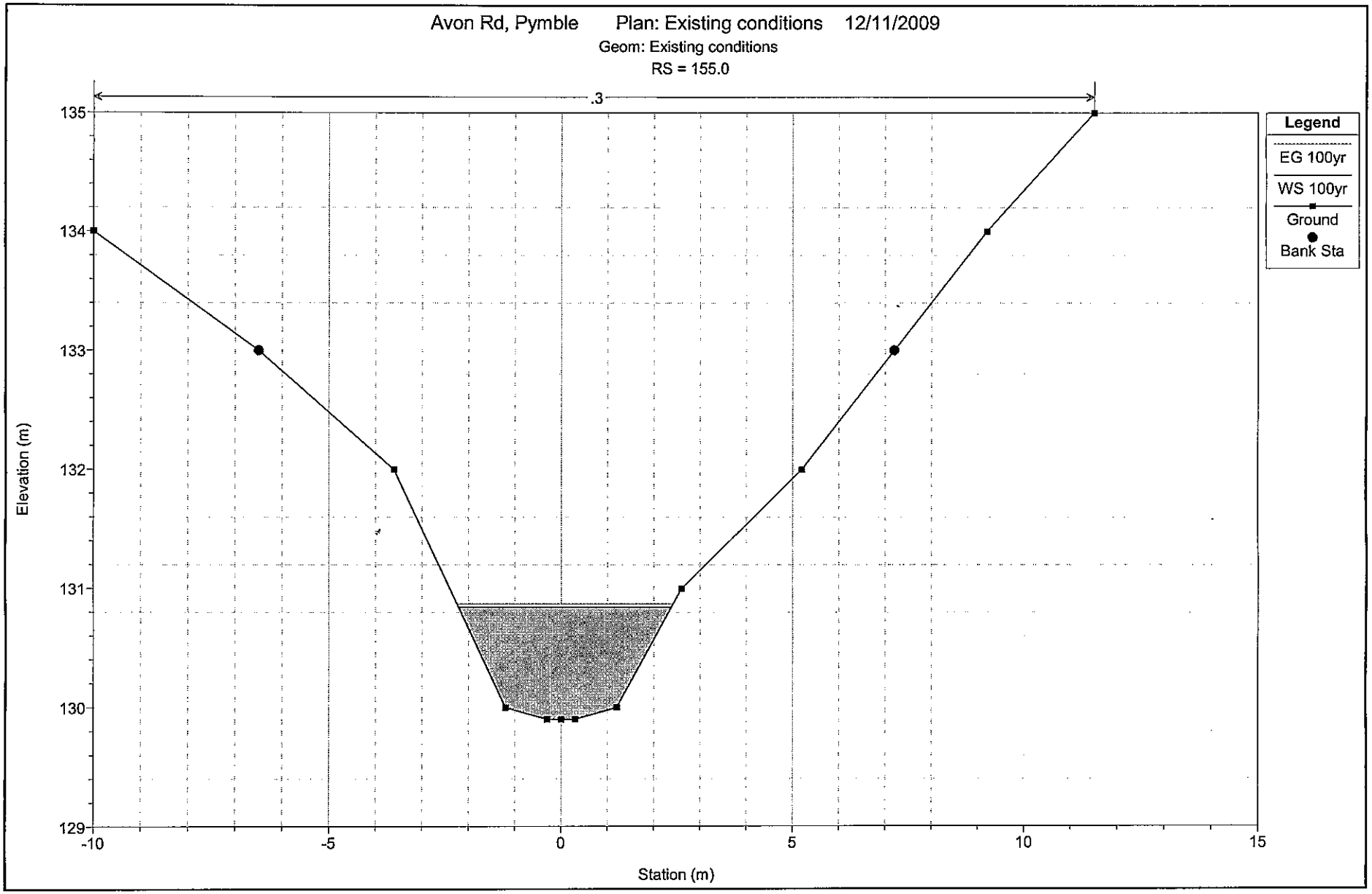
Reach	River Sta	Q Total	Q Left	Q Channel	Q Right	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m3/s)	(m3/s)	(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Avon Rd	200.0	1.73		1.73		139.50	139.78	139.78	139.85	1.702189	1.23	1.41	9.37	1.01
Avon Rd	175	2.20		2.20		132.90	133.68	133.30	133.70	0.085140	0.62	3.52	6.55	0.27
Avon Rd	169.00	2.20		2.20		132.00	132.83	132.56	132.88	0.261392	0.99	2.23	4.60	0.45
Avon Rd	155.0	2.20		2.20		129.90	130.84		130.87	0.089768	0.71	3.10	4.59	0.28
Avon Rd	136.0	2.20		2.20		128.38	129.26		129.28	0.077963	0.54	4.11	9.19	0.26
Avon Rd	125.0	3.22		3.22		127.50	128.22	127.93	128.24	0.108346	0.65	4.95	10.67	0.30
Avon Rd	97.5	3.22		3.22		125.25	126.31		126.32	0.048788	0.49	6.54	11.75	0.21
Avon Rd	81.00	3.22		3.22		124.00	124.77	124.52	124.80	0.177628	0.74	4.34	11.22	0.38
Avon Rd	65.0	3.22		3.22		122.80	123.92		123.93	0.025796	0.42	7.65	11.16	0.16
Avon Rd	43.0	3.22		3.22		121.25	121.98	121.98	122.16	1.348709	1.91	1.69	4.65	1.01
Avon Rd	29.0	3.22		3.22		119.41	120.91	120.04	120.92	0.020086	0.41	7.90	8.68	0.14
Avon Rd	24.0	3.22		3.22		118.95	120.83		120.84	0.014354	0.39	8.23	5.71	0.10
Avon Rd	20.0	3.22		3.22		118.72	120.71		120.73	0.059134	0.62	5.18	4.31	0.18
Avon Rd	14.00	2.47		2.47	0.00	118.44	120.30	119.92	120.31	0.091217	0.49	5.01	9.00	0.21
Avon Rd	4.0	2.47		2.38	0.09	119.30	119.66	119.66	119.83	0.028390	1.84	1.80	6.51	0.98
Avon Rd	-14.00	2.90		2.86	0.04	118.17	118.42	118.57	118.91	0.090325	3.12	1.11	5.80	1.98
Avon Rd	-19.50	2.90		2.84	0.06	117.50	117.74	117.89	118.29	0.146750	3.31	1.08	5.80	2.16
Avon Rd	-34.00	2.90	0.00	2.88	0.02	116.30	117.06	116.67	117.08	0.000438	0.62	4.79	8.50	0.25
Avon Rd	-42.00	3.38	0.00	3.31	0.07	116.10	117.05		117.07	0.017719	0.64	5.53	8.98	0.25
Avon Rd	-46.80	3.38	0.01	3.34	0.02	116.16	117.03		117.05	0.001764	0.64	6.06	14.15	0.25
Avon Rd	-55.10	3.38	0.69	2.67	0.01	116.17	117.03		117.04	0.000592	0.46	8.61	18.83	0.17
Avon Rd	-65.60	3.38	1.85	1.53	0.01	116.47	117.02		117.03	0.000850	0.46	7.65	21.24	0.23
Avon Rd	-70.60	3.38	0.00	3.38		116.50	116.99		117.02	0.002309	0.69	4.86	17.19	0.41
Avon Rd	-80.60	3.38		3.38		116.47	116.86	116.86	116.96	0.015475	1.40	2.41	12.23	1.01

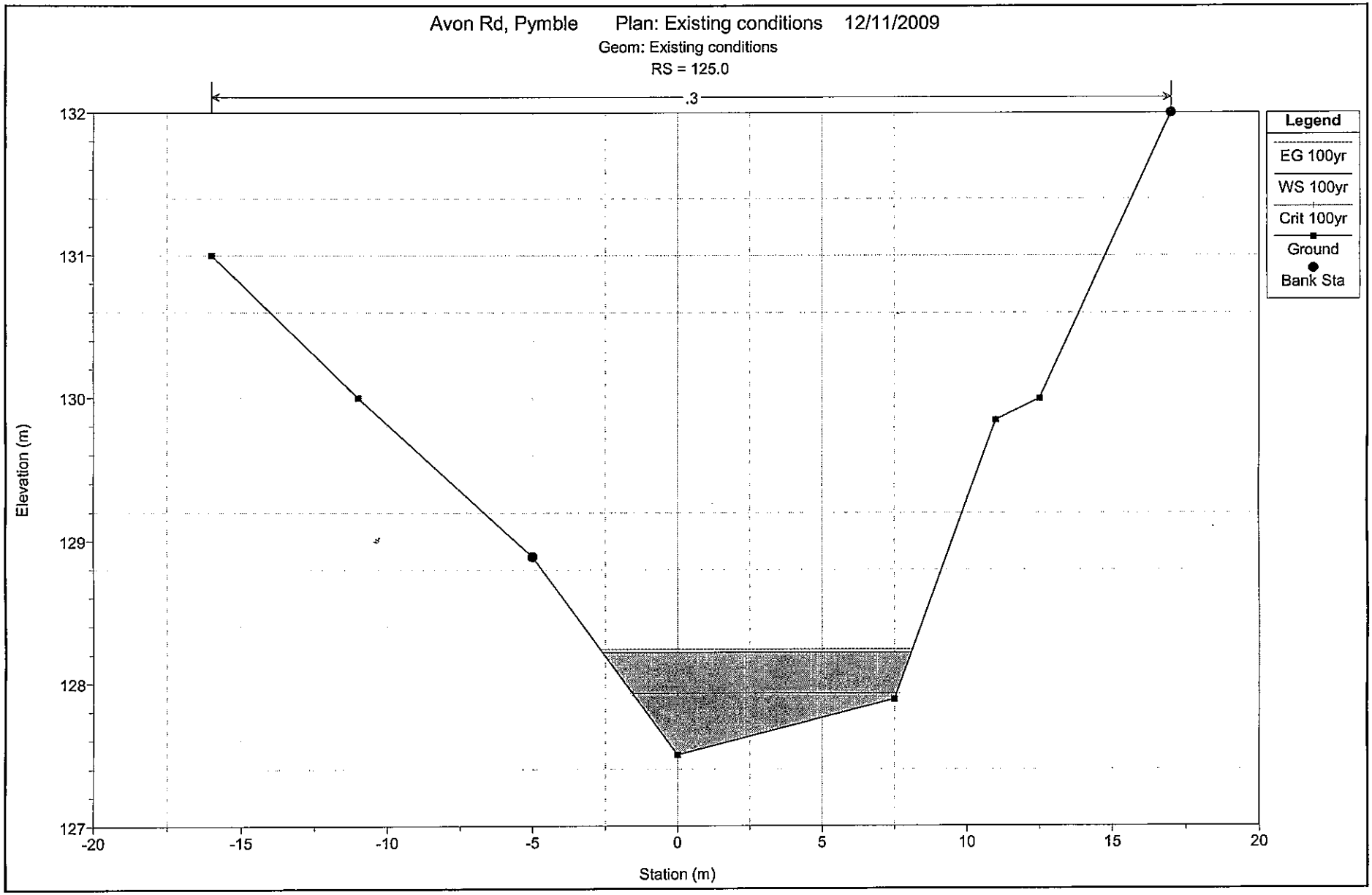

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 200.0 STN 200.00
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
145
144
143
142
141
140
139
-20
-10
0
10
20
30
40
50
60

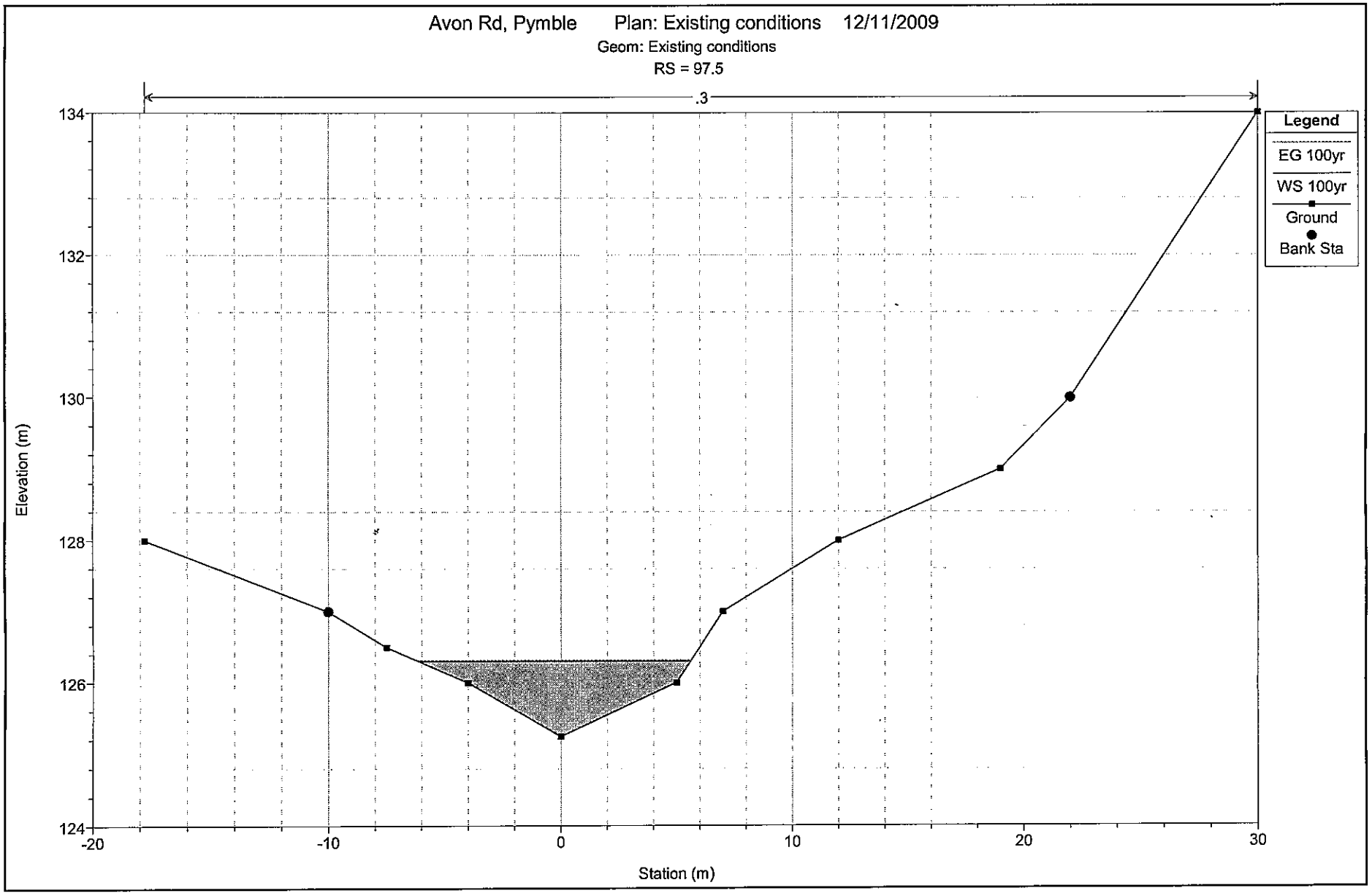

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 175
.3
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
140
139
138
137
136
135
134
133
132
-15
-10
-5
0
5
10
15
20

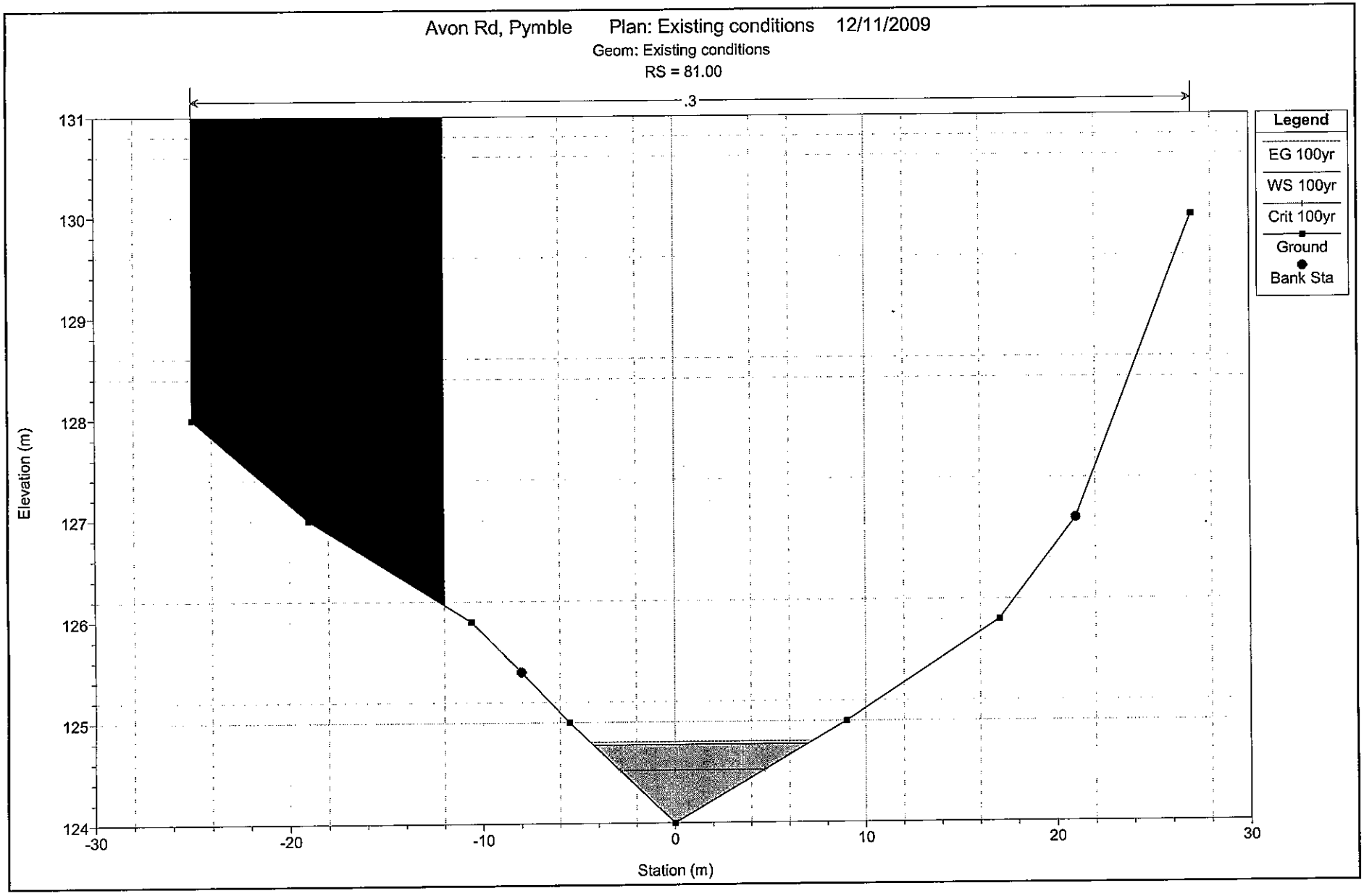

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 169.00
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
136
135
134
133
132
-15
-10
-5
0
5
10
Station (m)

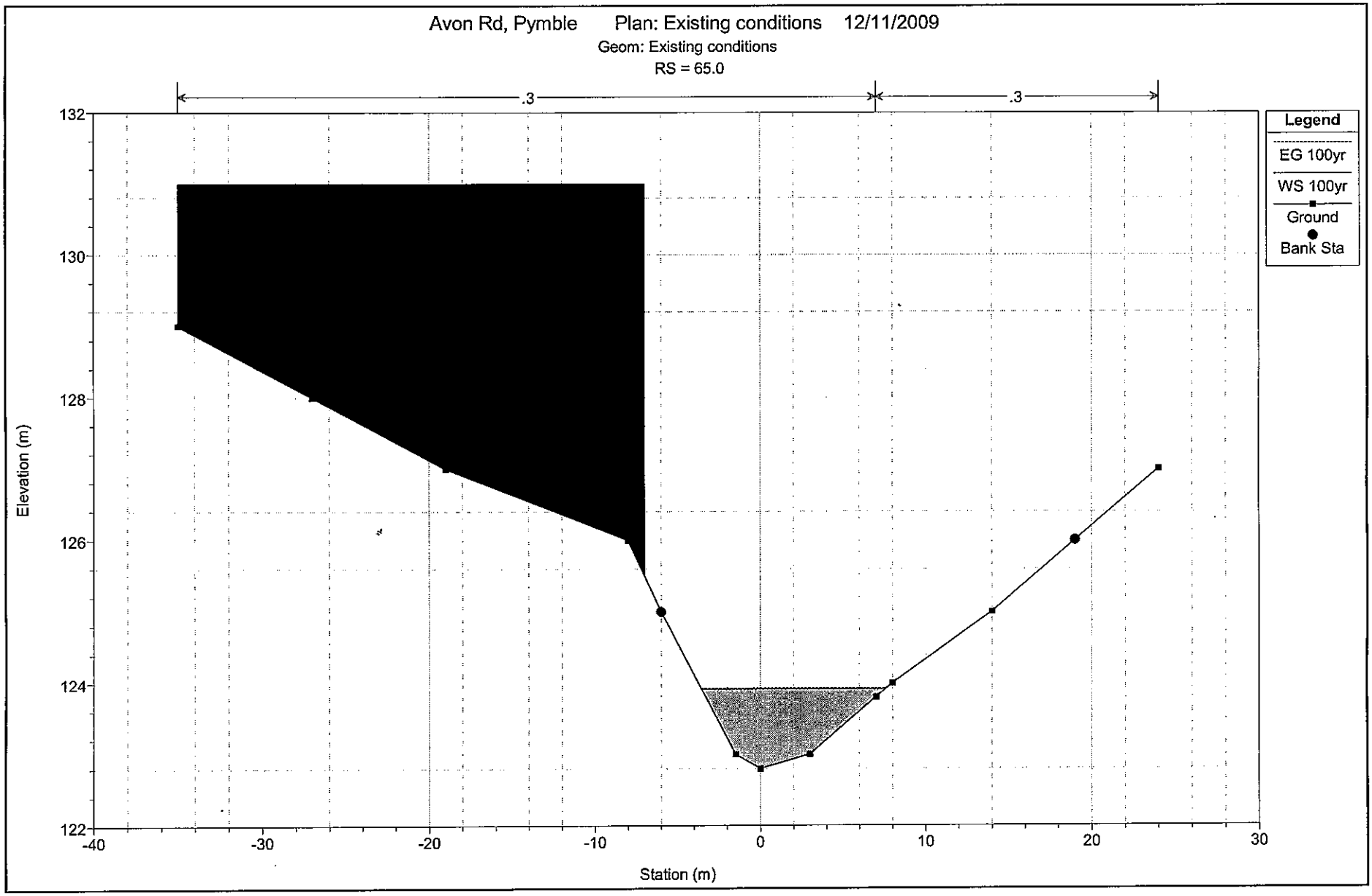

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 136.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
131.5
131.0
130.5
130.0
129.5
129.0
128.5
128.0
-15
-10
-5
0
5
10
Station (m)

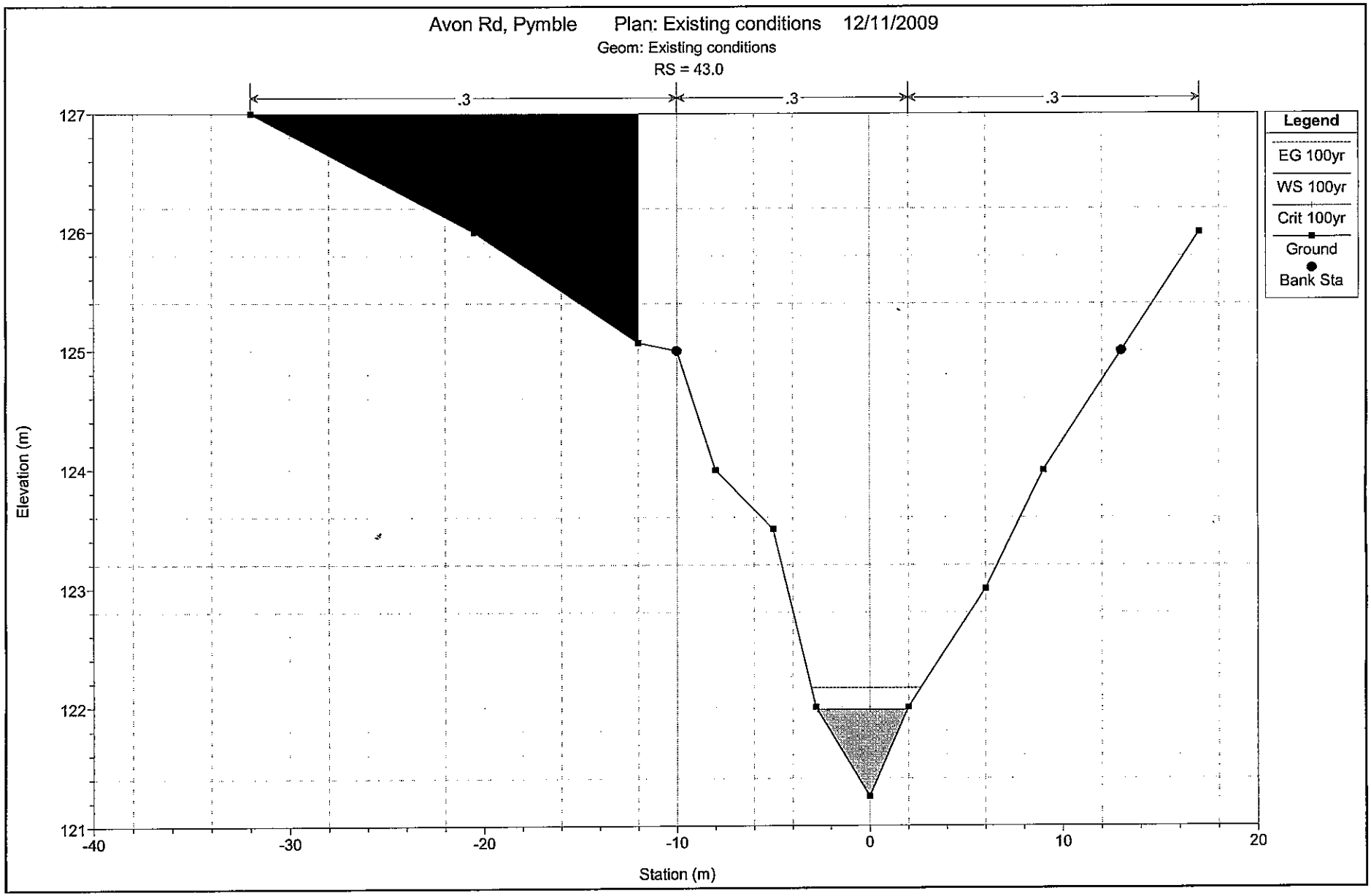

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 155.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
135
134
133
132
131
130
129
-10
-5
0
5
10
15
Station (m)

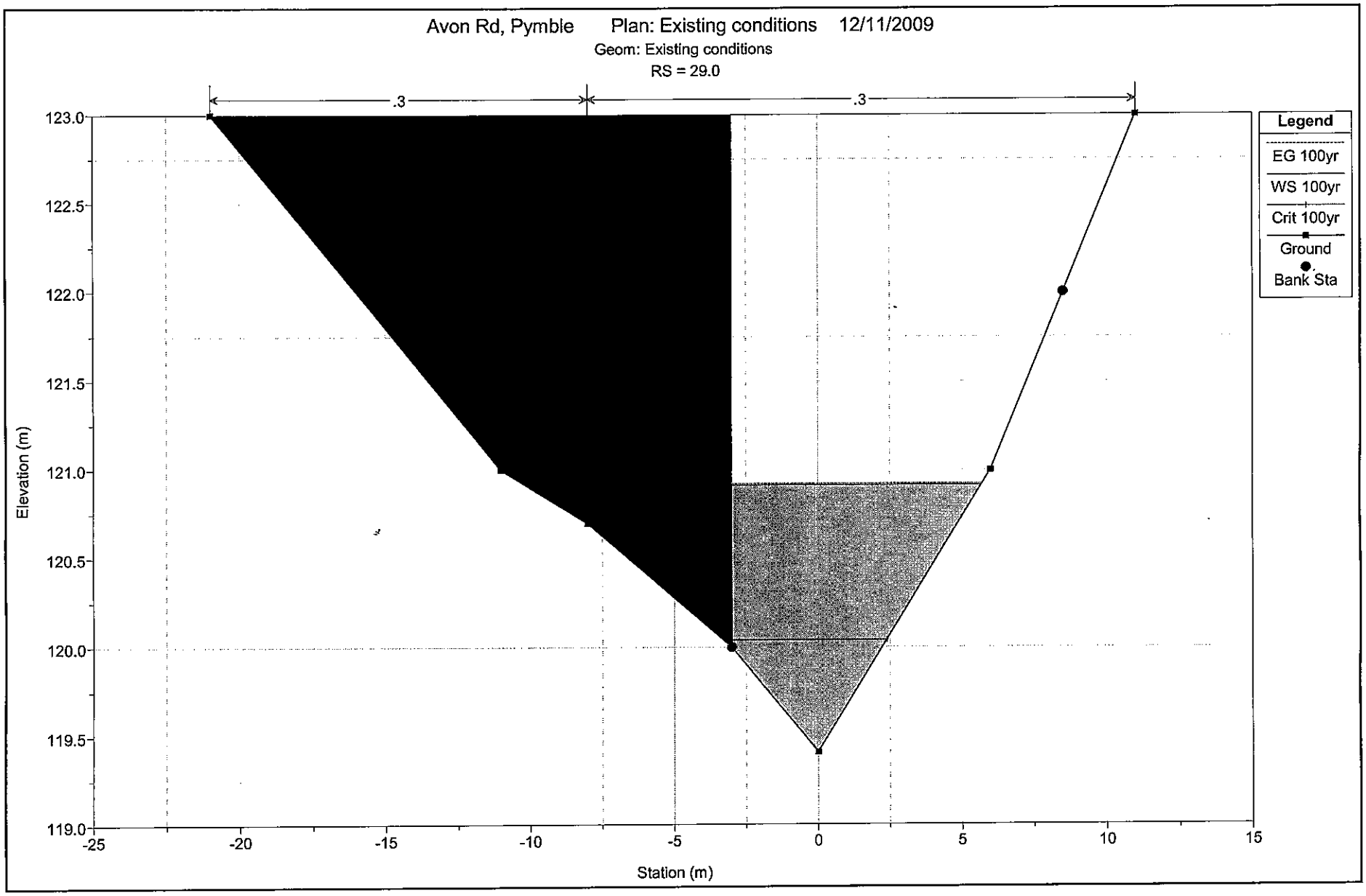

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 125.0
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
132
131
130
129
128
127
-20
-15
-10
-5
0
5
10
15
20

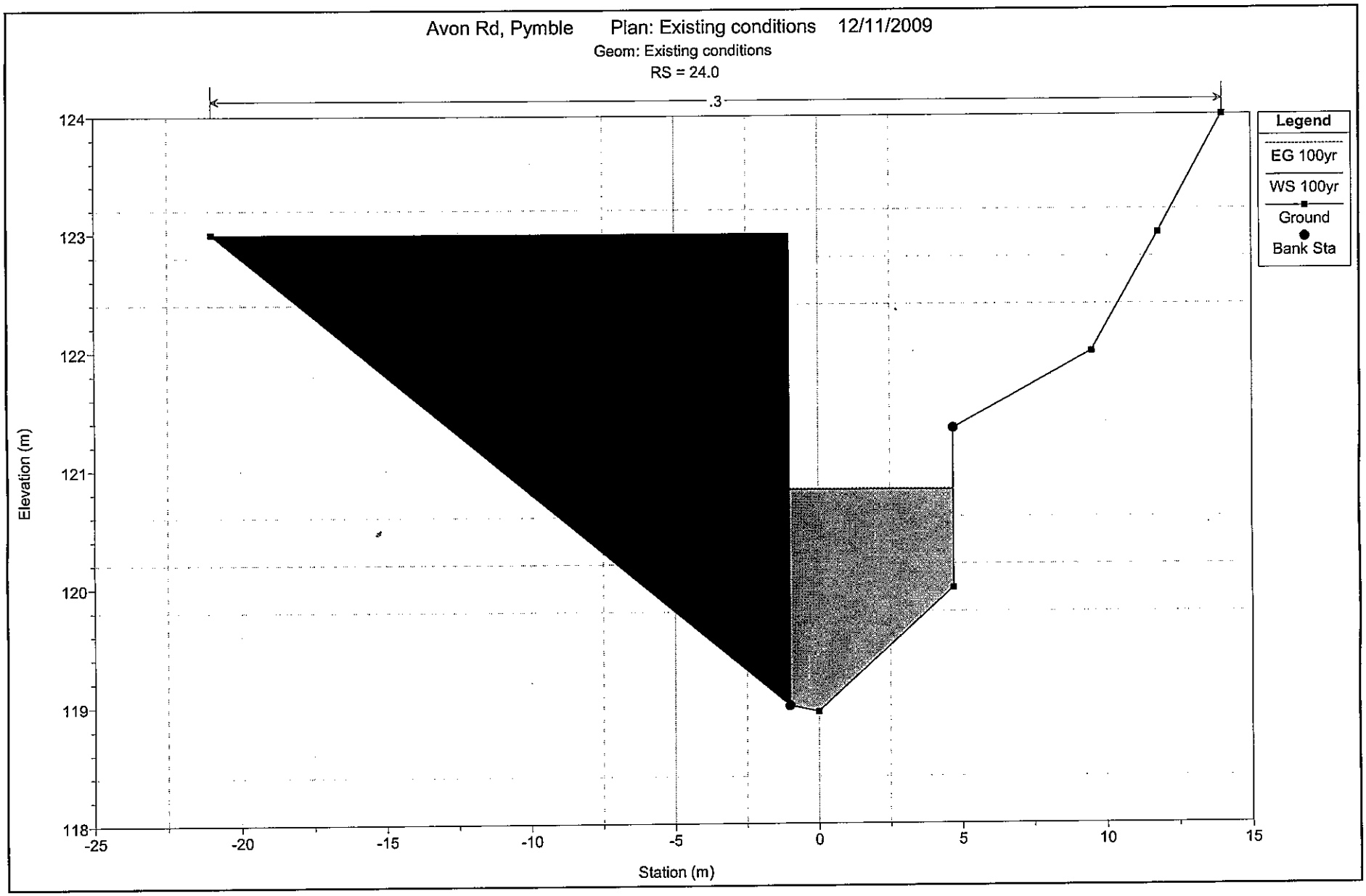

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 97.5
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
134
132
130
128
126
124
-20
-10
0
10
20
30
Station (m)

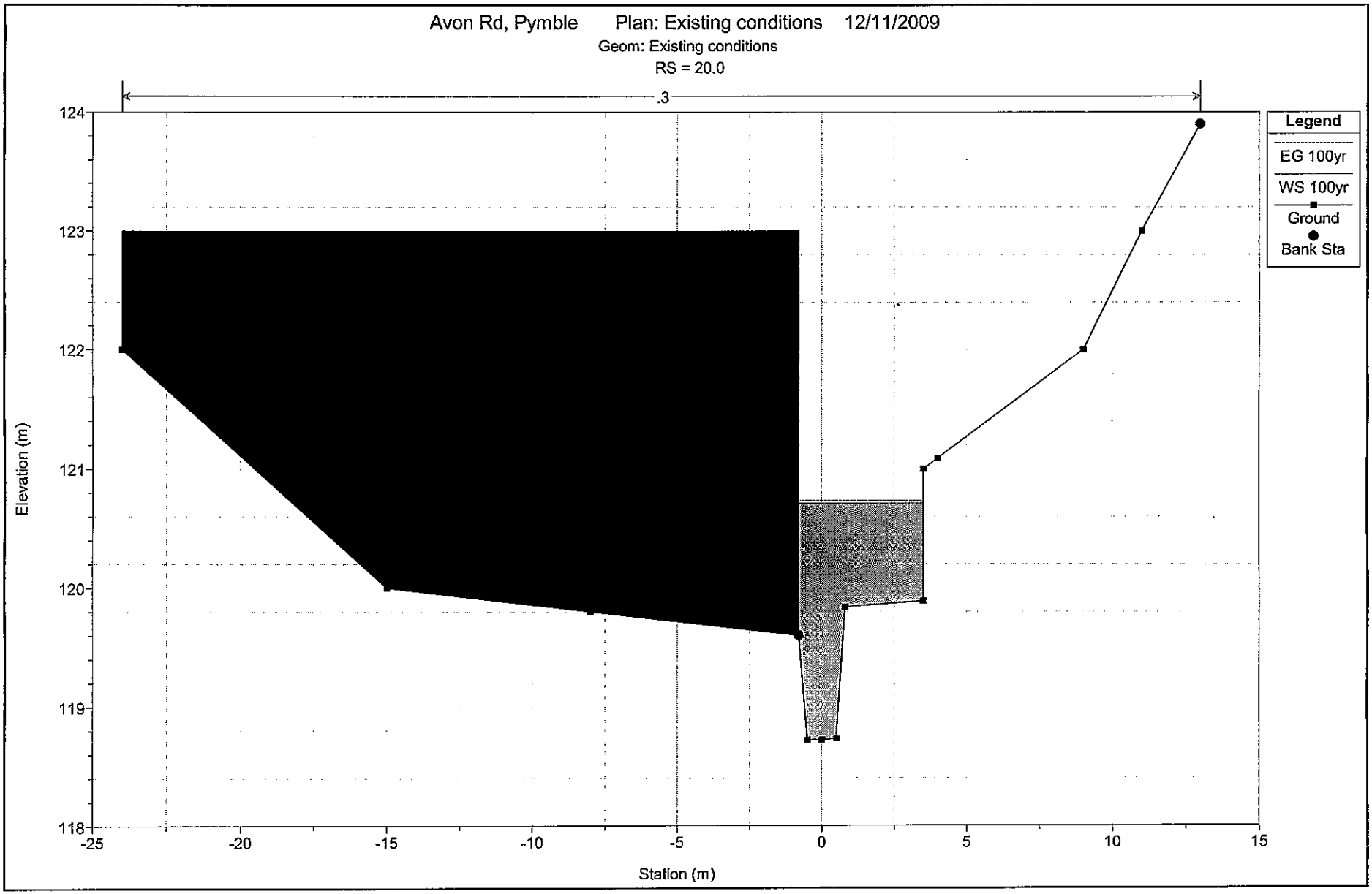

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 81.00
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
131
130
129
128
127
126
125
124
-30
-20
-10
0
10
20
30
Station (m)

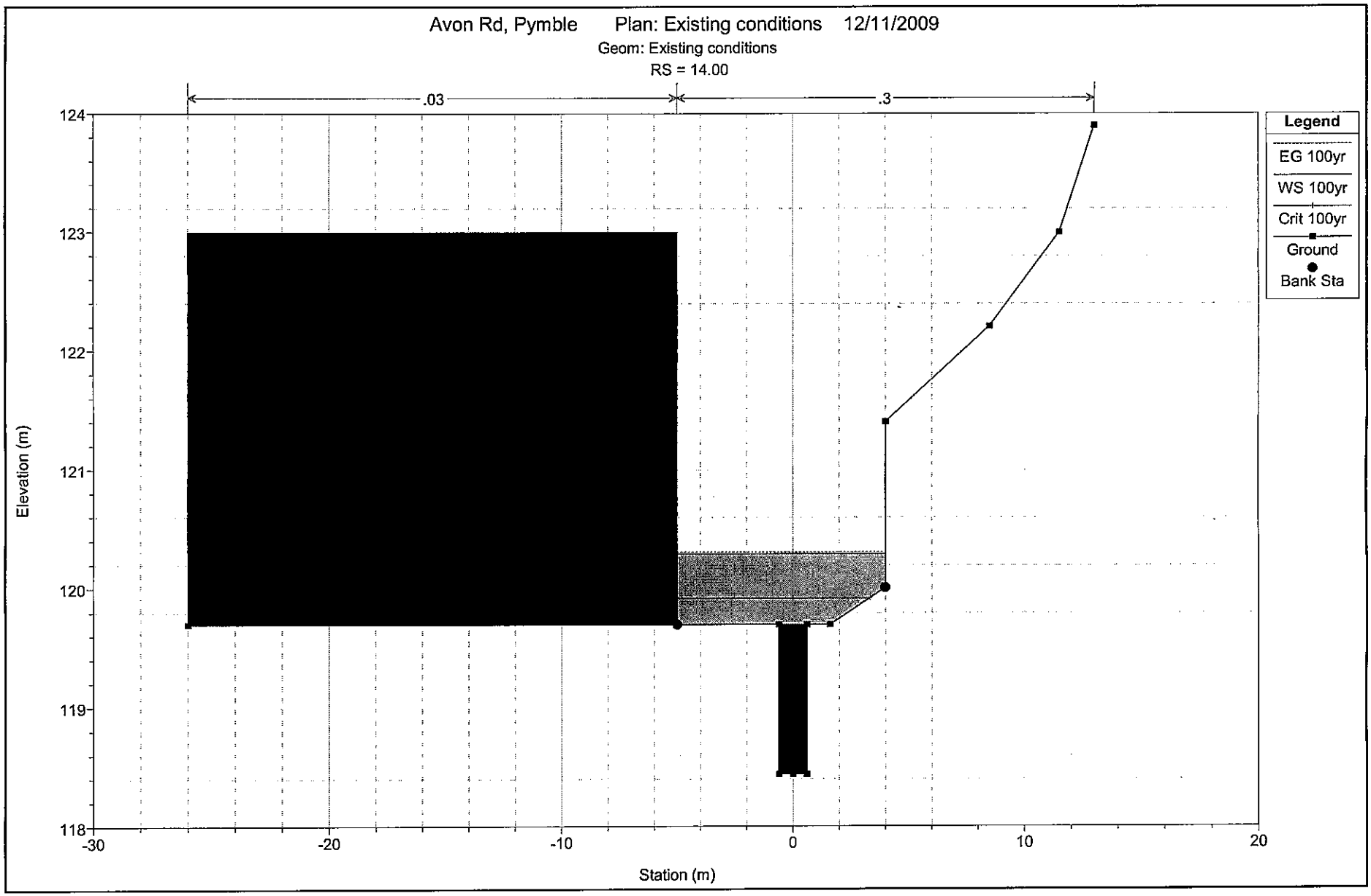

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 65.0
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
132
130
128
126
124
122
-40
-30
-20
-10
0
10
20
30

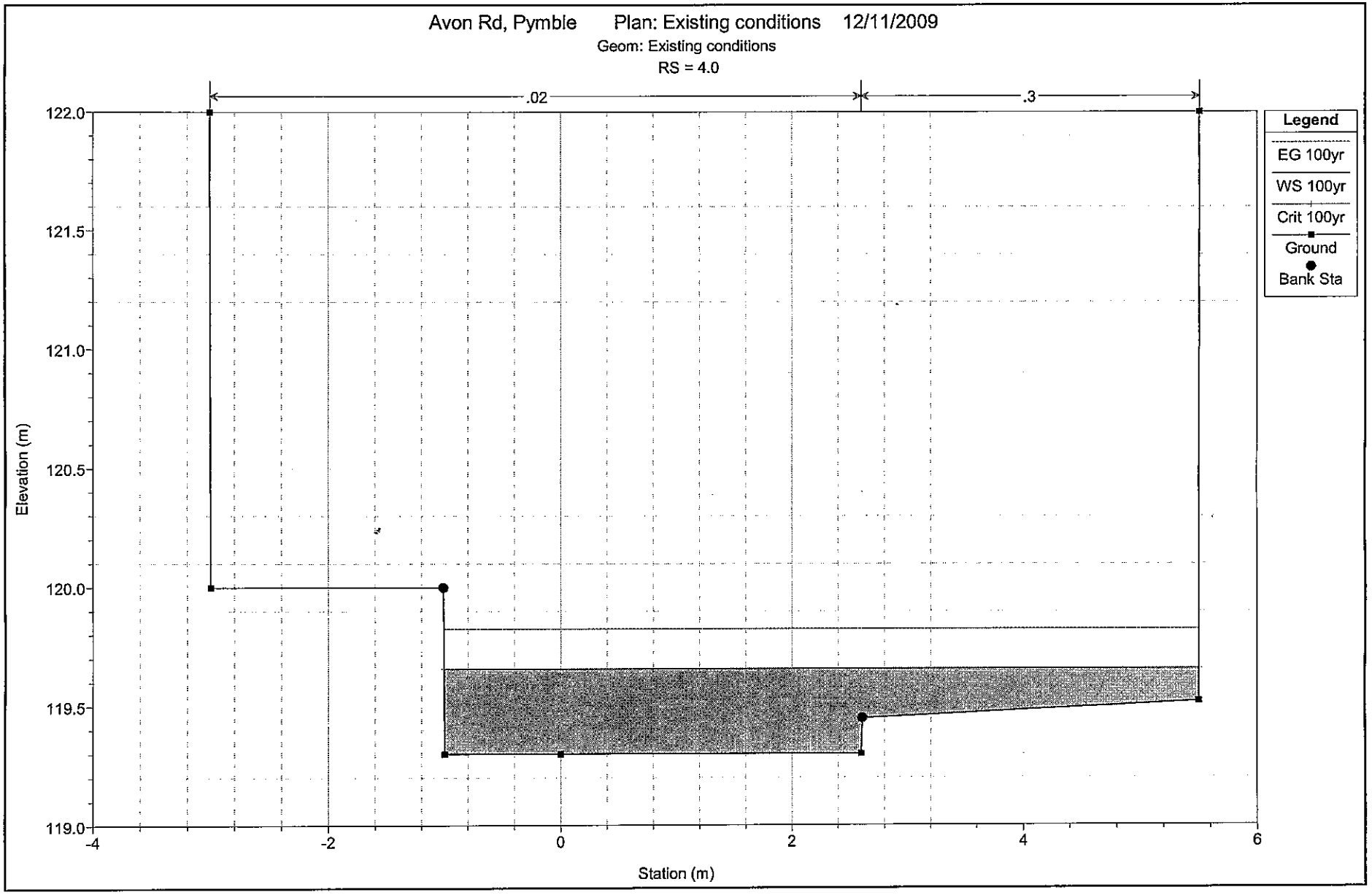

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 43.0
.3
.3
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
127
126
125
124
123
122
121
-40
-30
-20
-10
0
10
20
Station (m)

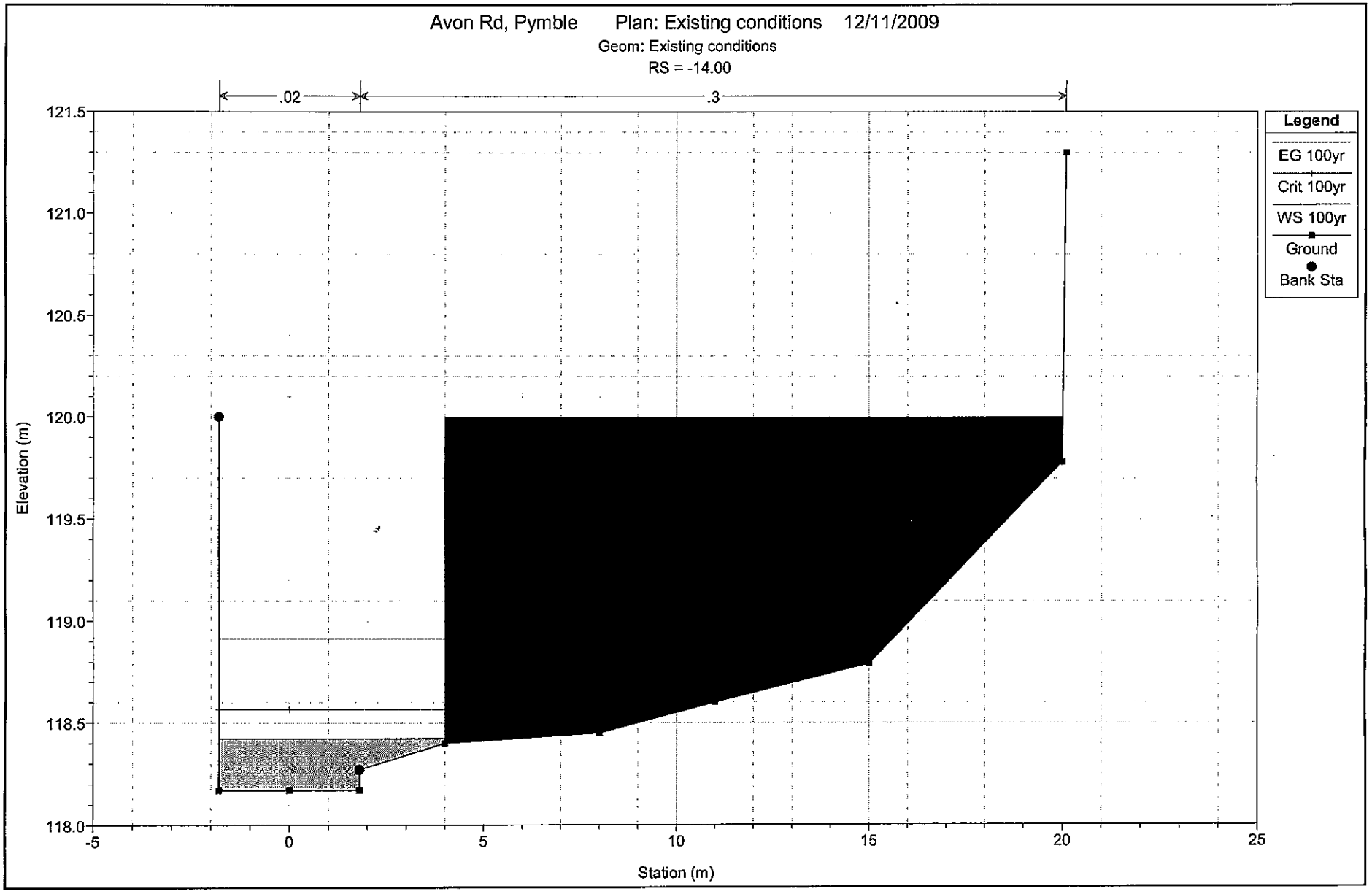

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 29.0
.3
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
123.0
122.5
122.0
121.5
121.0
120.5
120.0
119.5
119.0
-25
-20
-15
-10
-5
0
5
10
15
Station (m)

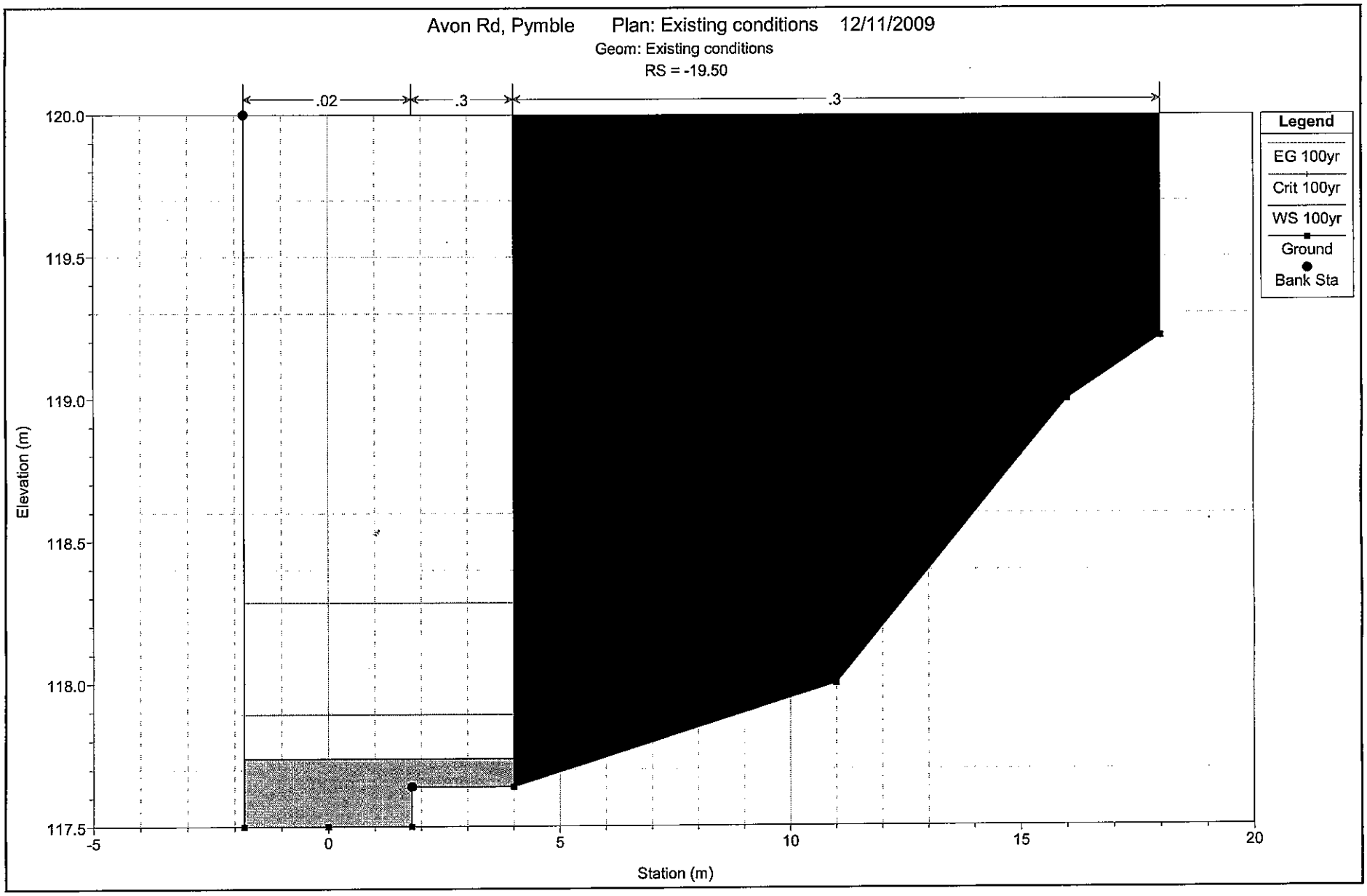

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 24.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
124
123
122
121
120
119
118
-25
-20
-15
-10
-5
0
5
10
15

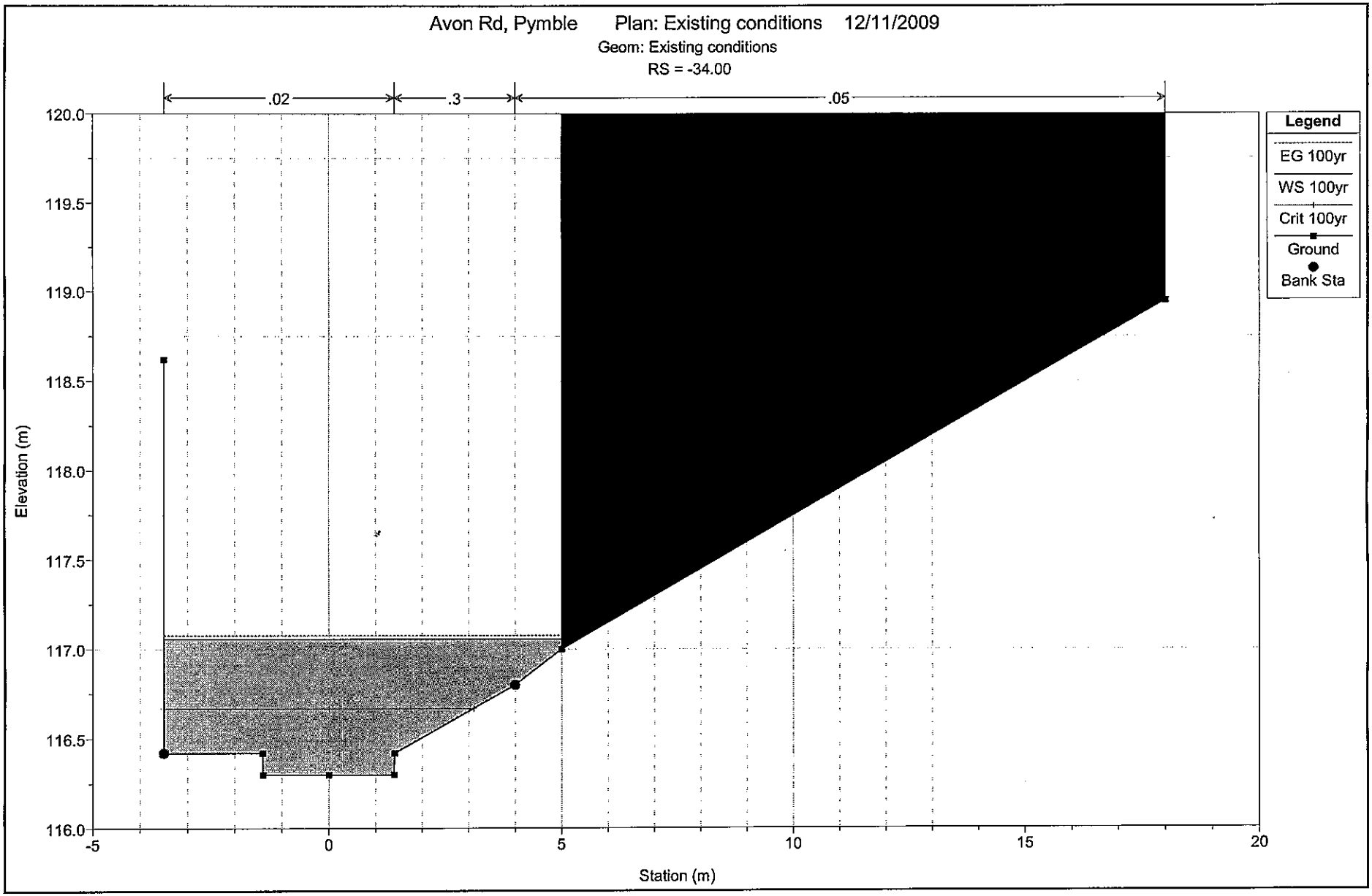

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 20.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
124
123
122
121
120
119
118
-25
-20
-15
-10
-5
0
5
10
15

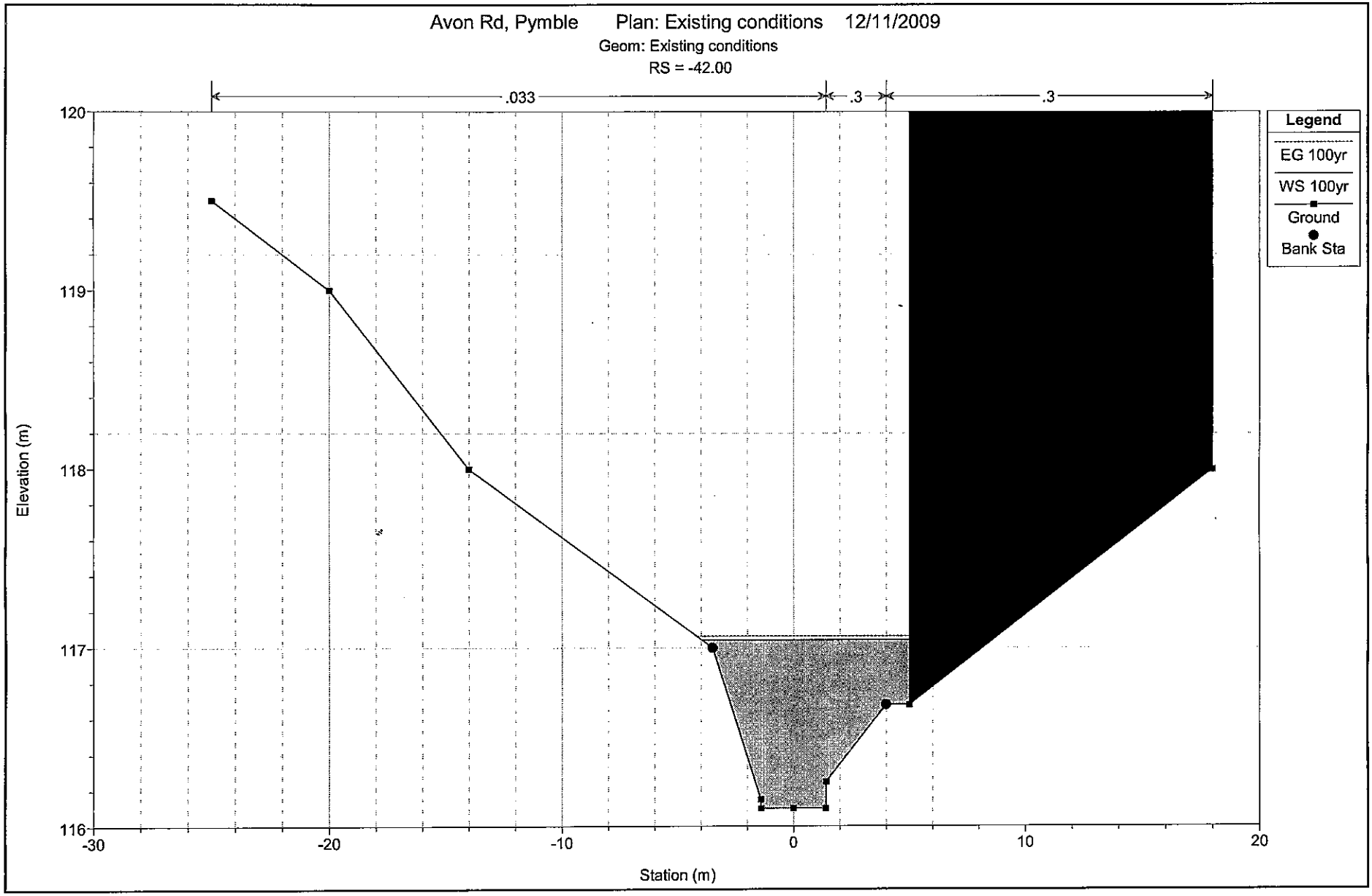

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 14.00
.03
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
124
123
122
121
120
119
118
-30
-20
-10
0
10
20

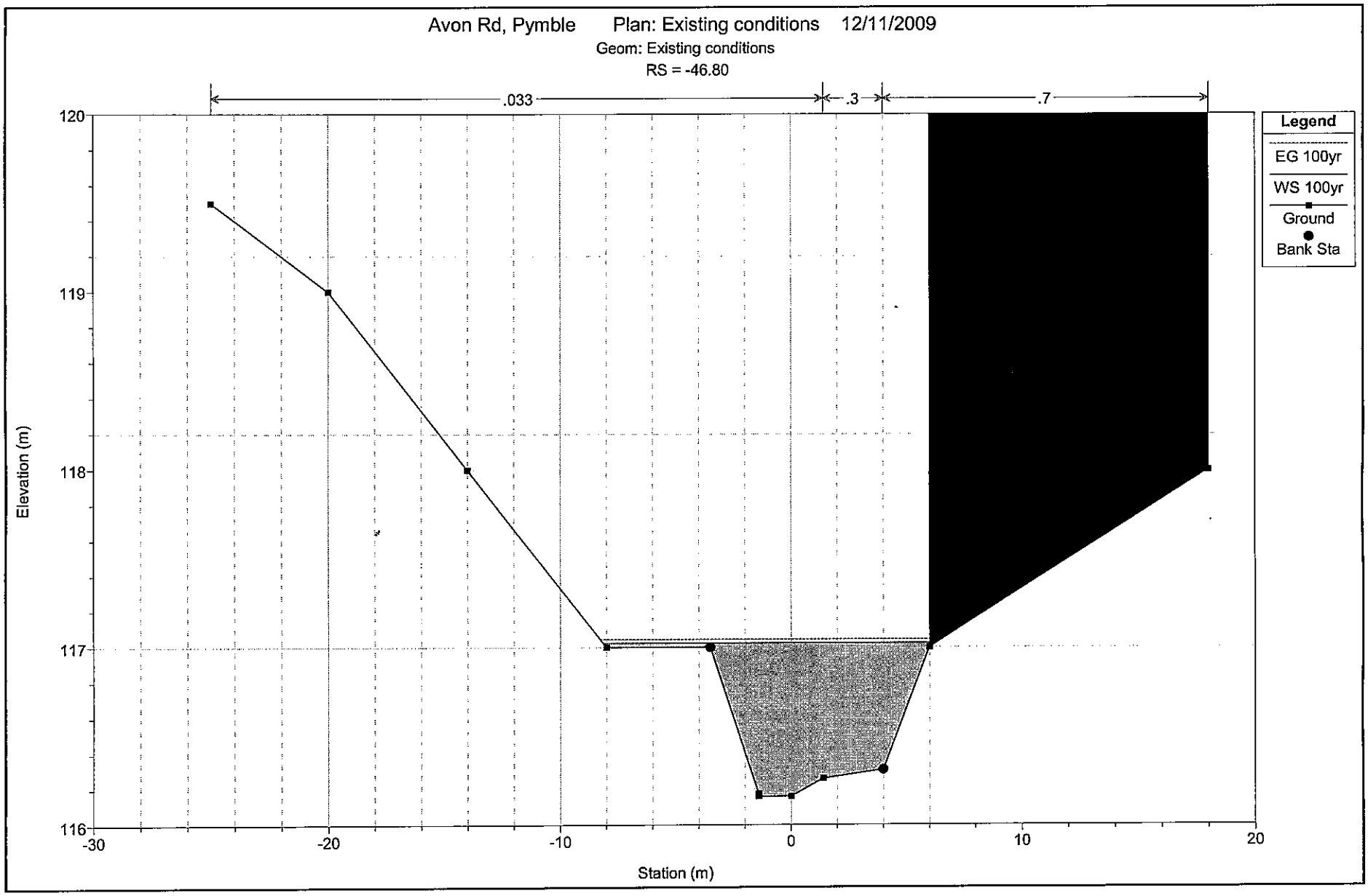

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = 4.0
.02
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
122.0
121.5
121.0
120.5
120.0
119.5
119.0
-4
-2
0
2
4
6
Station (m)

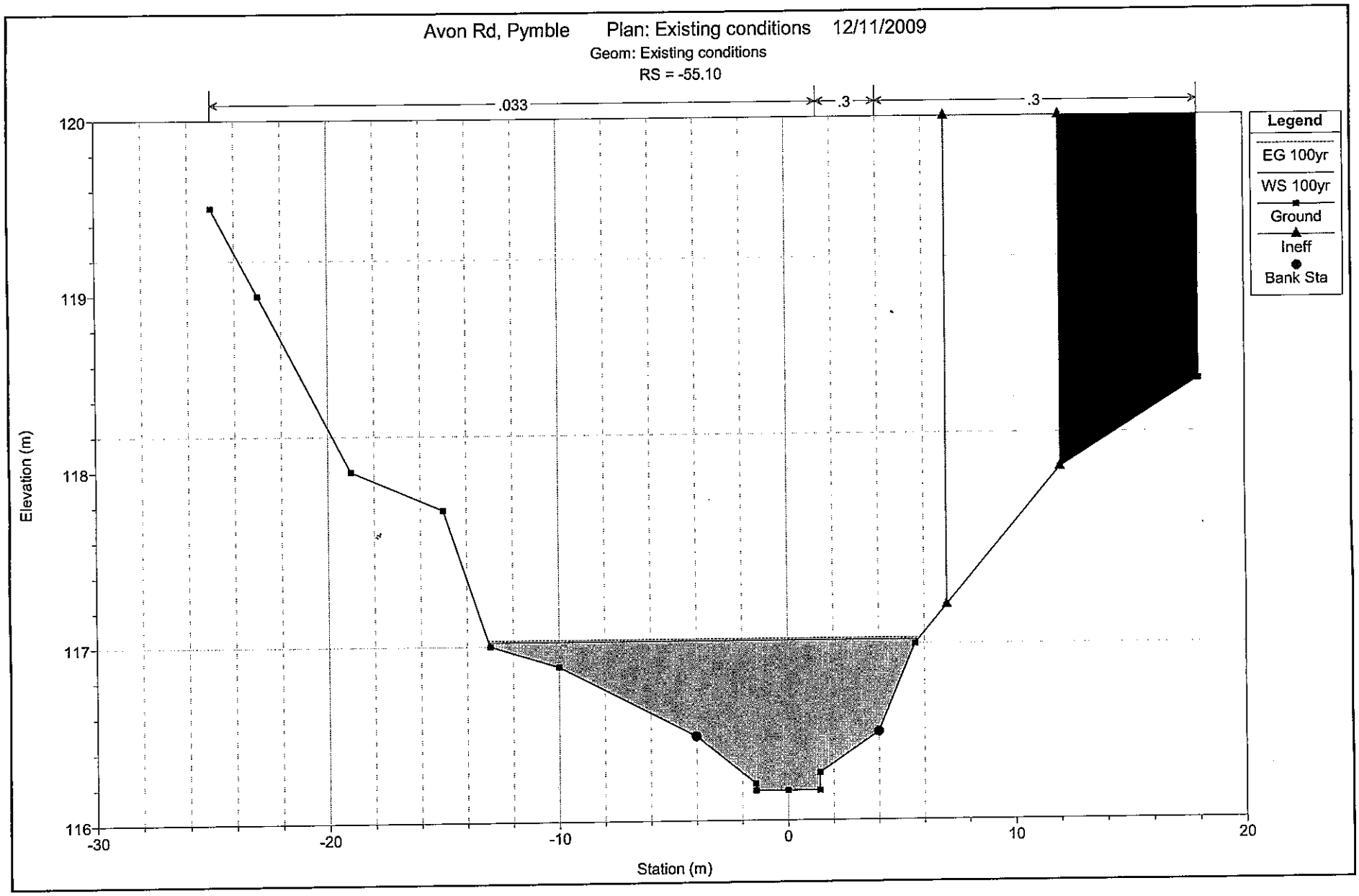

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -14.00
.02
.3
Legend
EG 100yr
Crit 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
121.5
121.0
120.5
120.0
119.5
119.0
118.5
118.0
-5
0
5
10
15
20
25

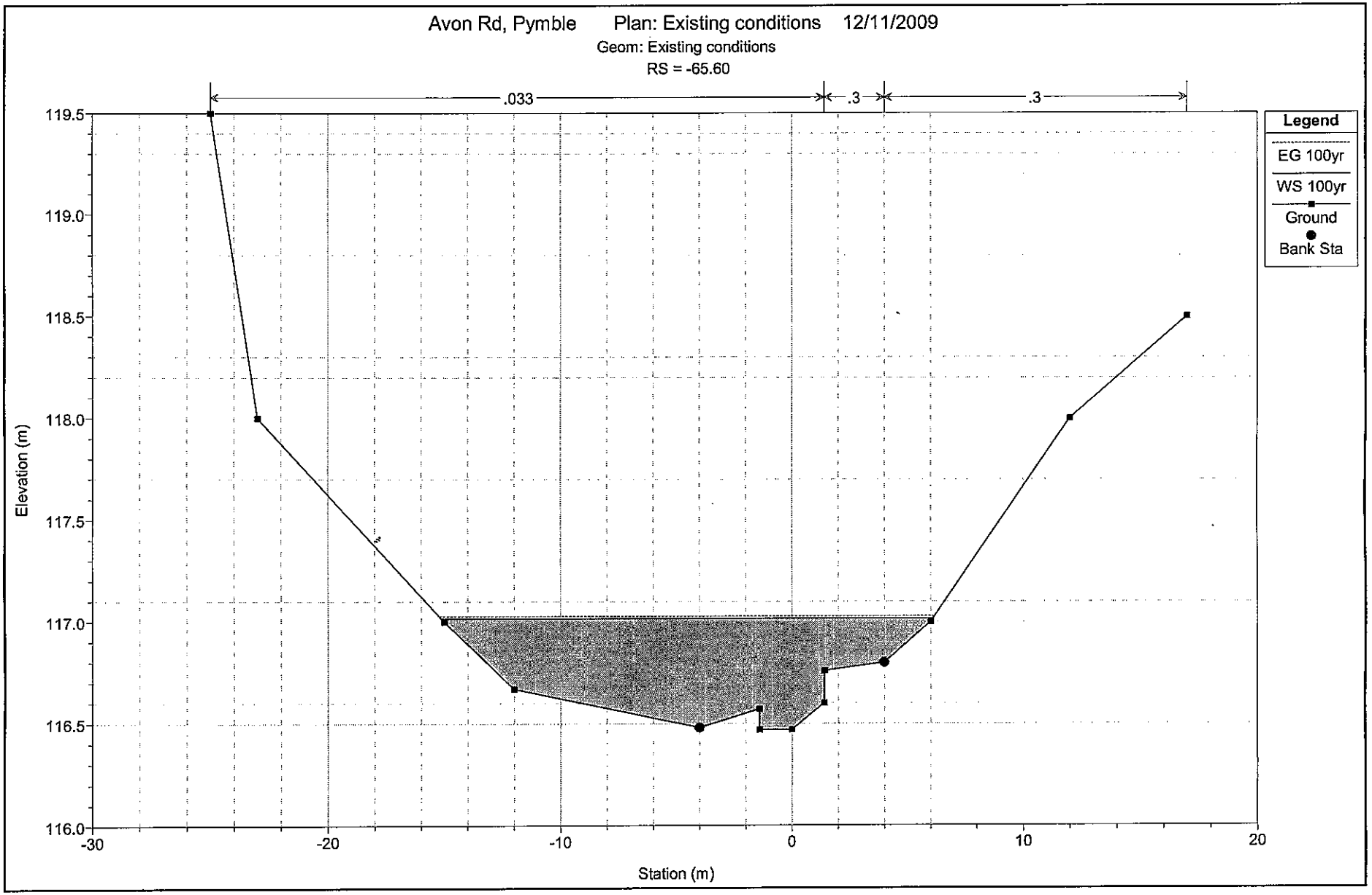

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -19.50
.02
.3
.3
Legend
EG 100yr
Crit 100yr
WS 100yr
Ground
Bank Sta
120.0
119.5
119.0
118.5
118.0
117.5
Elevation (m)
-5
0
5
10
15
20
Station (m)

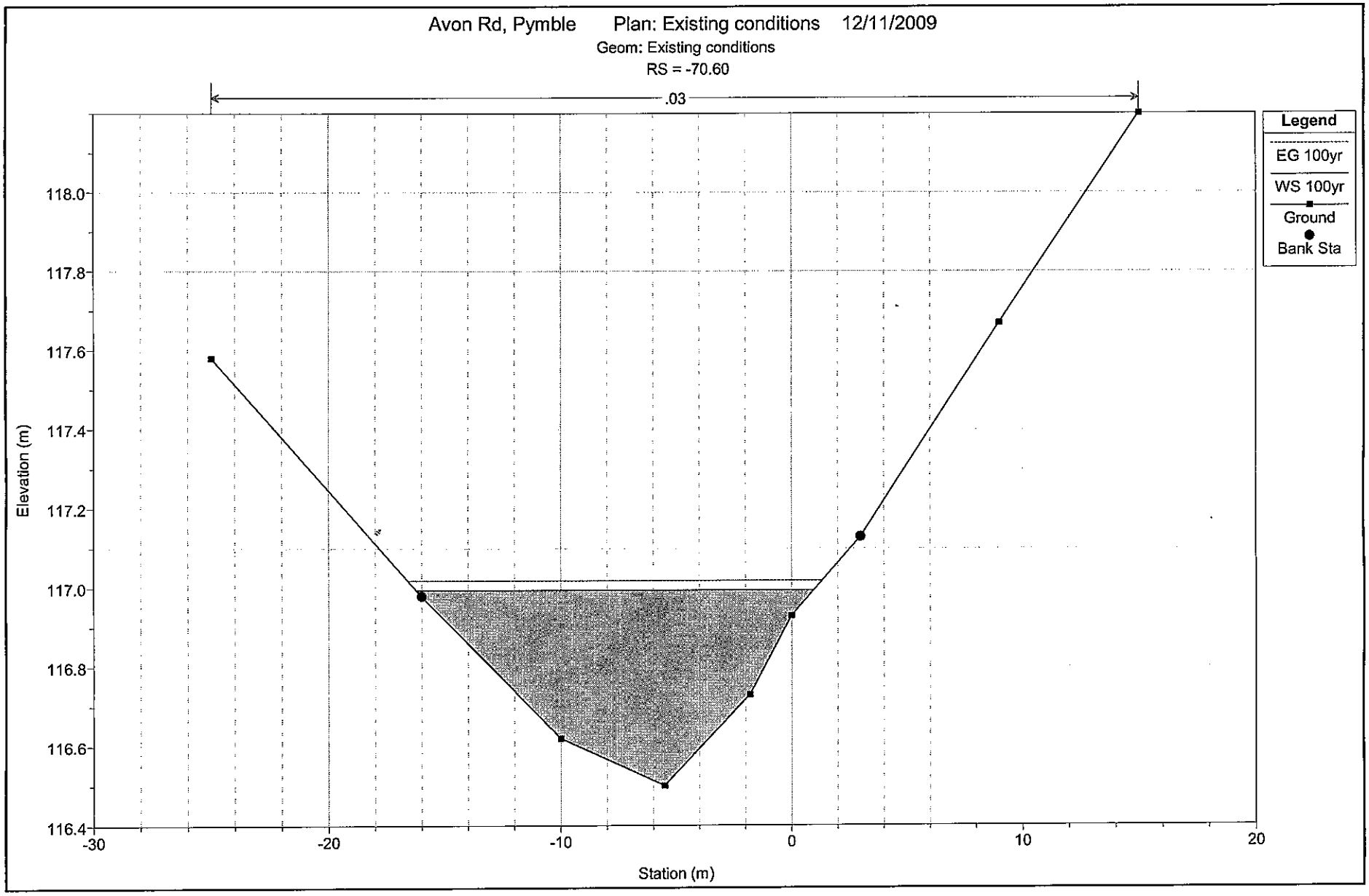

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -34.00
.02
.3
.05
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
120.0
119.5
119.0
118.5
118.0
117.5
117.0
116.5
116.0
-5
0
5
10
15
20

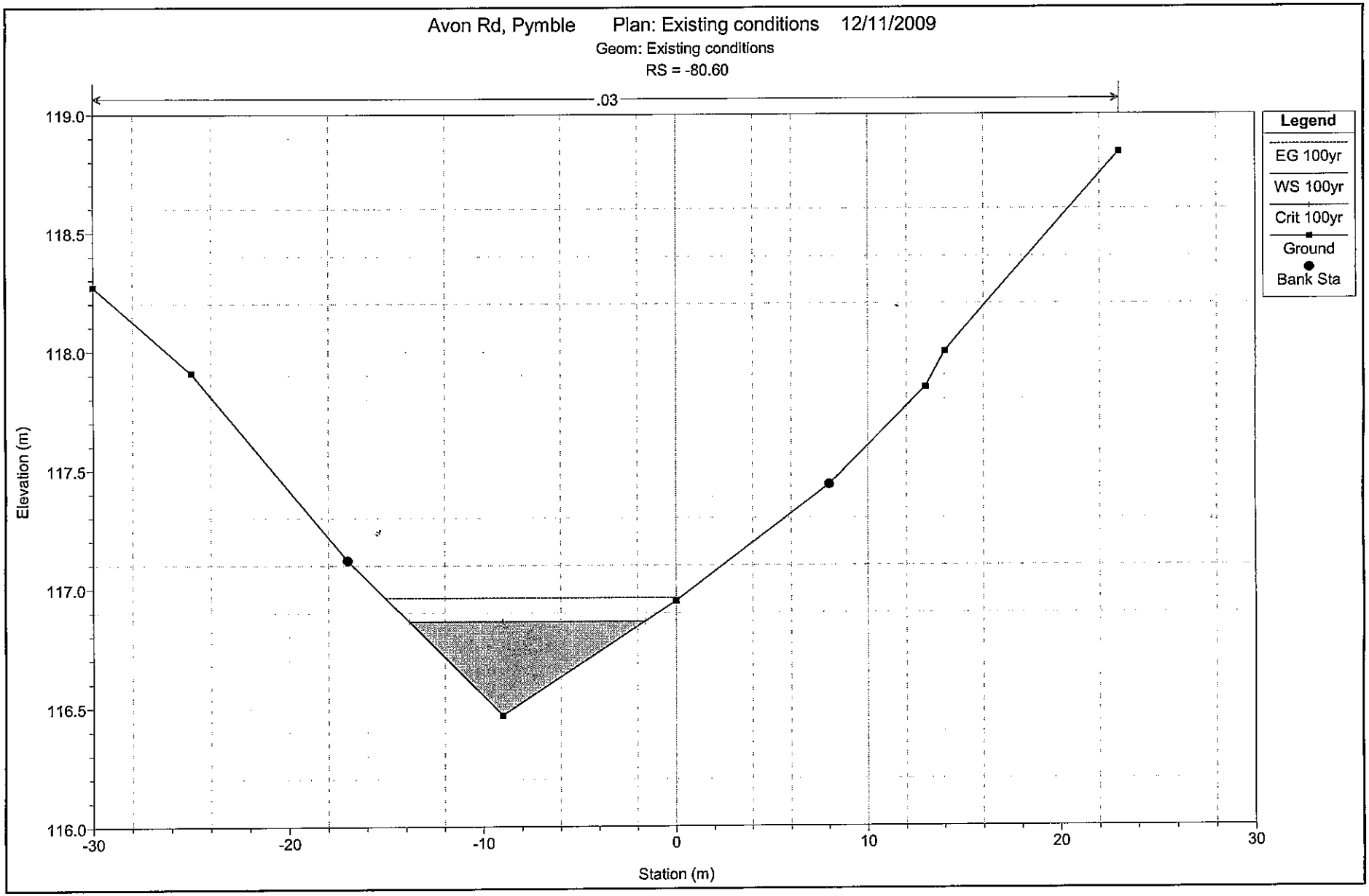

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -42.00
.033
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
120
119
118
117
116
-30
-20
-10
0
10
20
Station (m)

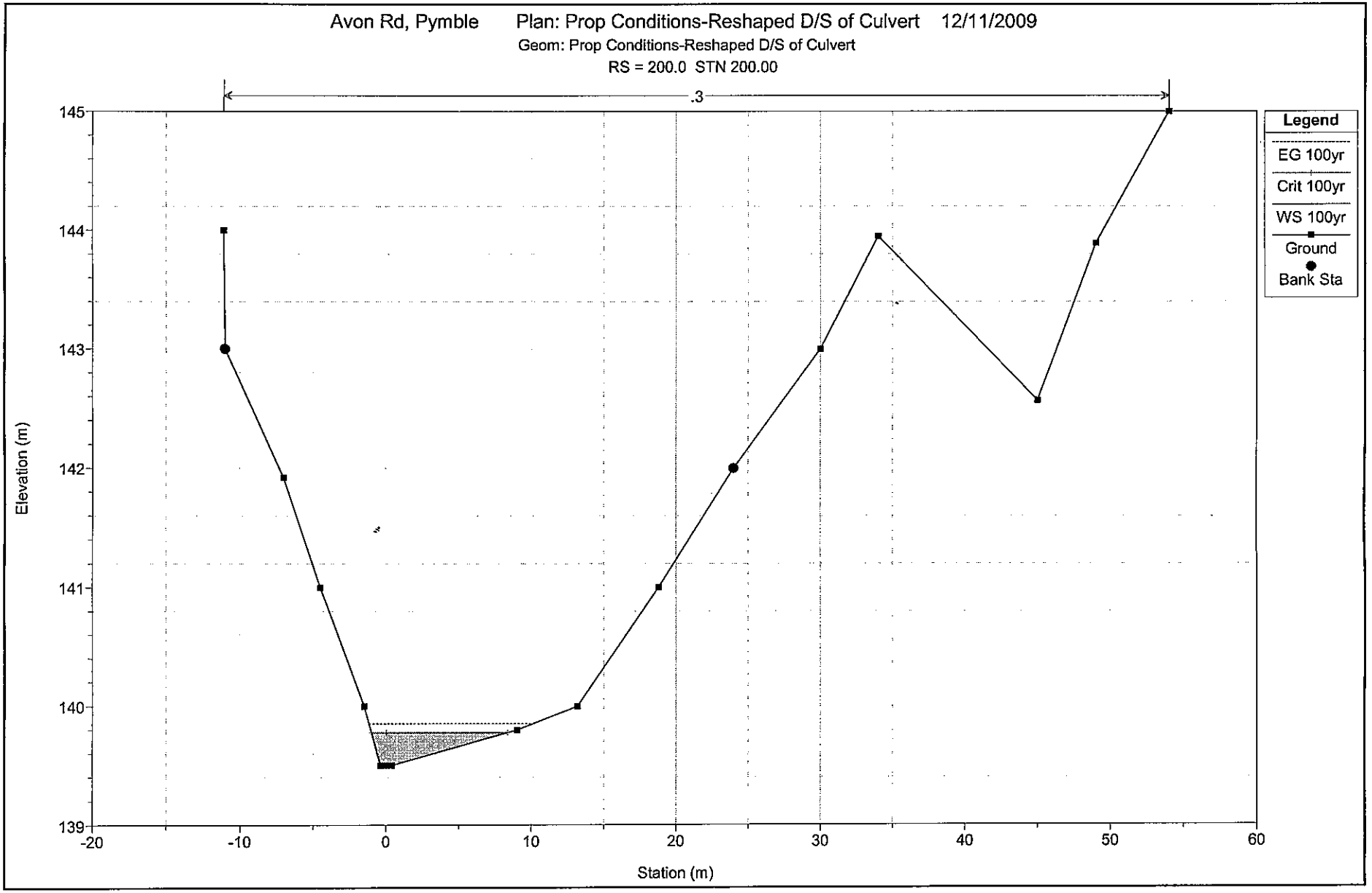

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -46.80
.033
.3
.7
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
120
119
118
117
116
-30
-20
-10
0
10
20
Station (m)

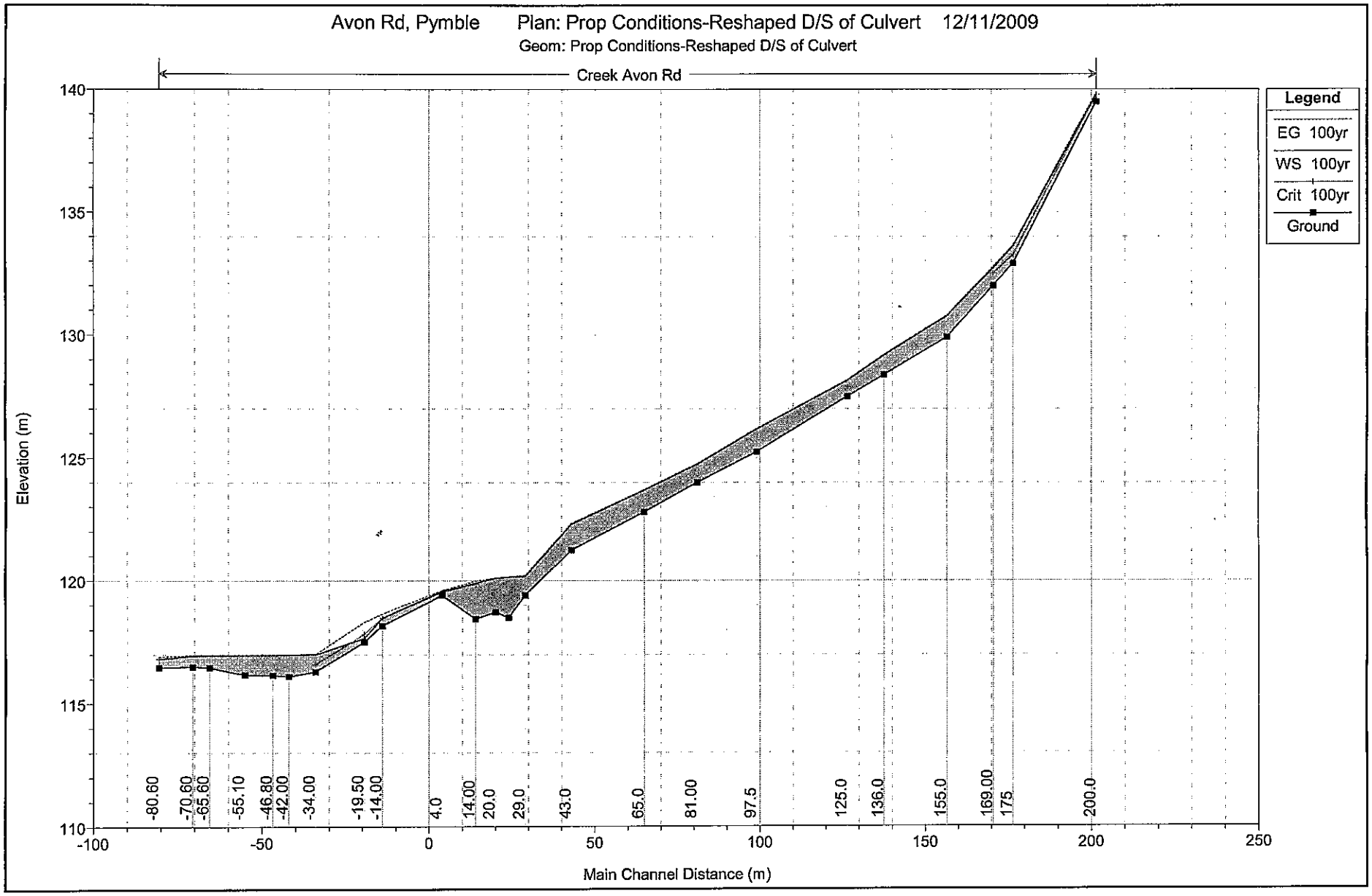

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -55.10
.033
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Ineff
Bank Sta
120
119
118
117
116
Elevation (m)
-30
-20
-10
0
10
20
Station (m)


Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -65.60
.033
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
119.5
119.0
118.5
118.0
117.5
117.0
116.5
116.0
-30
-20
-10
0
10
20


Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -70.60
.03
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
118.0
117.8
117.6
117.4
117.2
117.0
116.8
116.6
116.4
-30
-20
-10
0
10
20
Station (m)

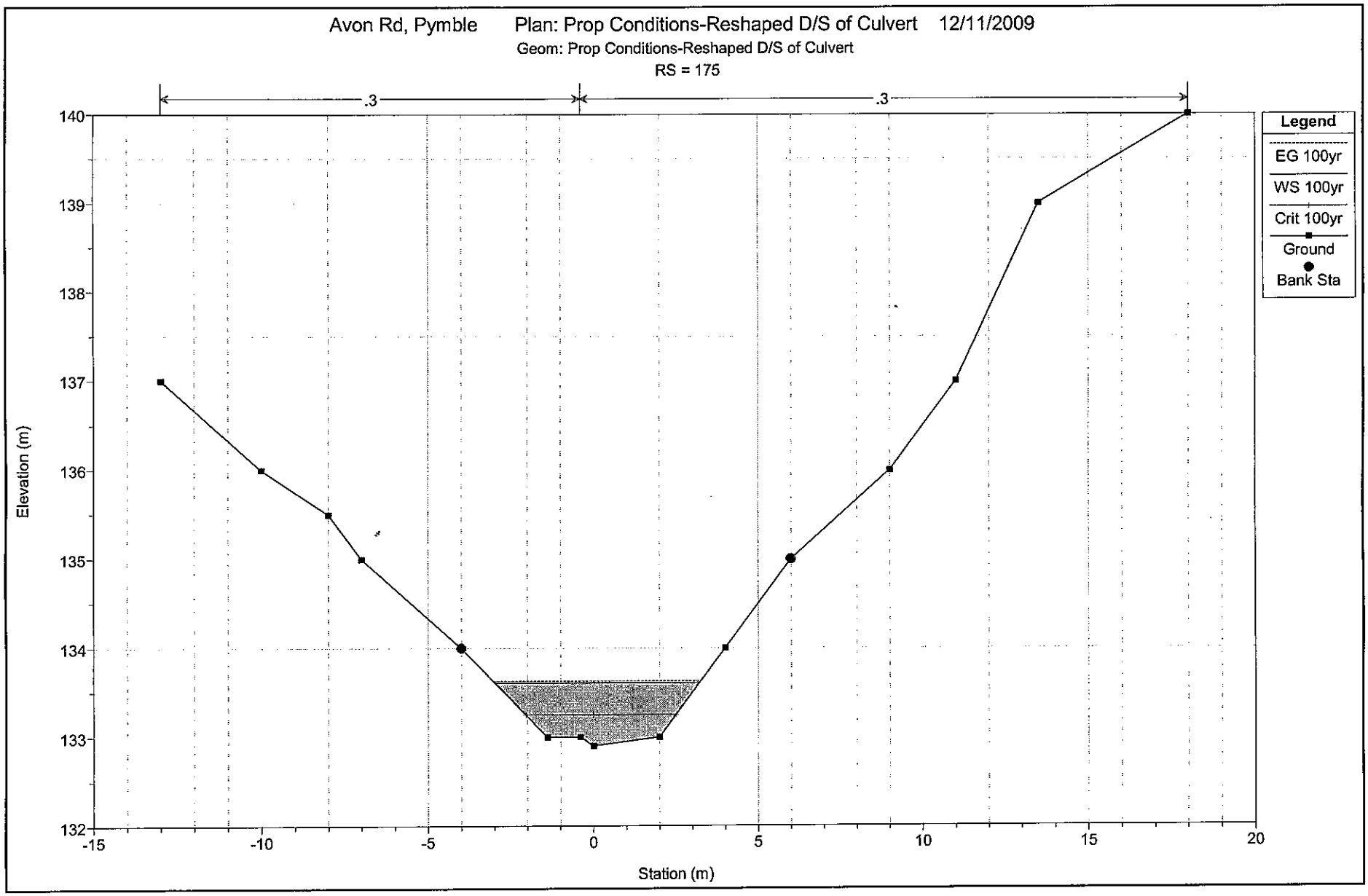

Avon Rd, Pymble Plan: Existing conditions 12/11/2009
Geom: Existing conditions
RS = -80.60
.03
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
119.0
118.5
118.0
117.5
117.0
116.5
116.0
-30
-20
-10
0
10
20
30

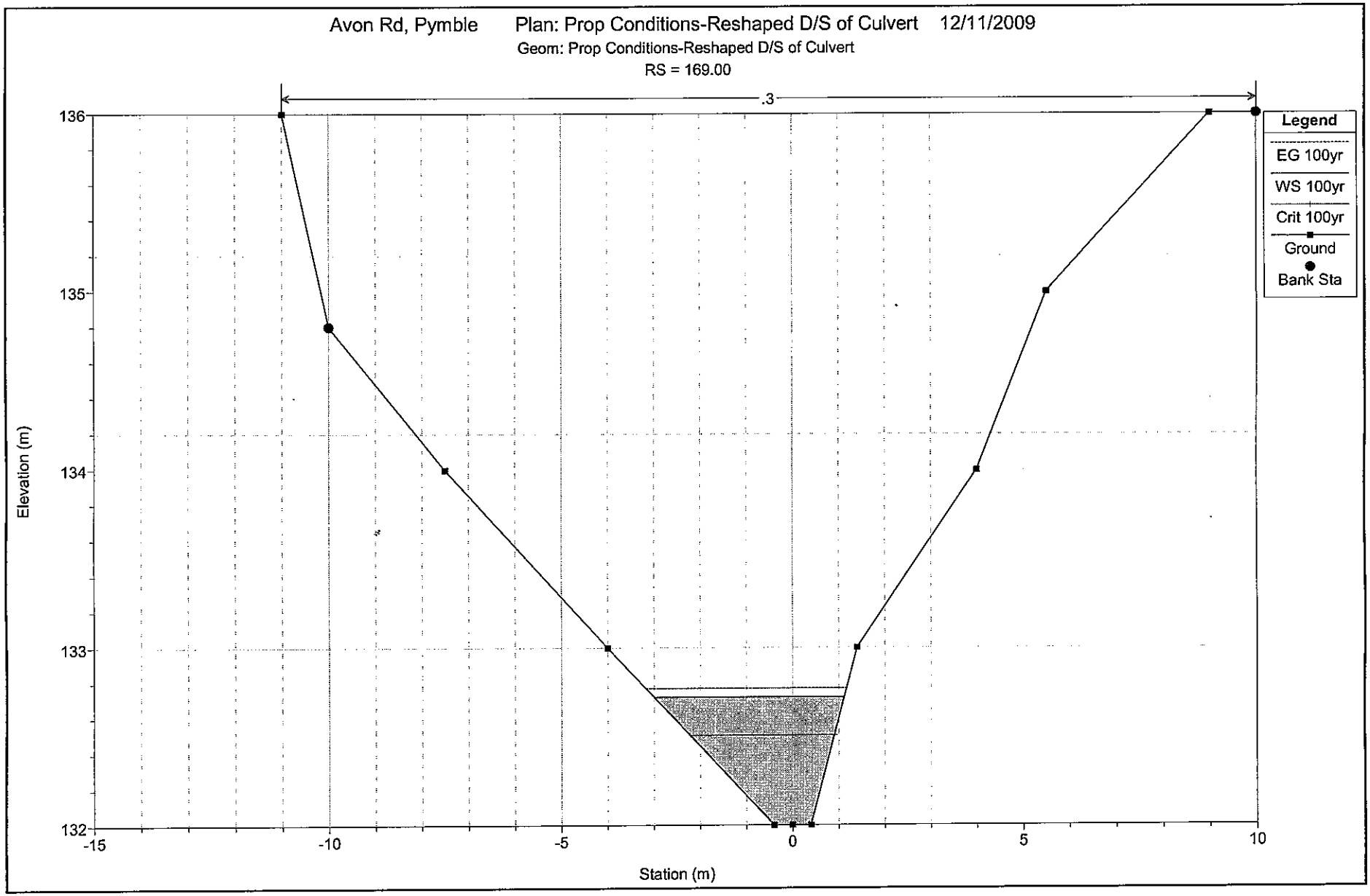

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 200.0 STN 200.00
.3
Legend
EG 100yr
Crit 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
145
144
143
142
141
140
139
-20
-10
0
10
20
30
40
50
60

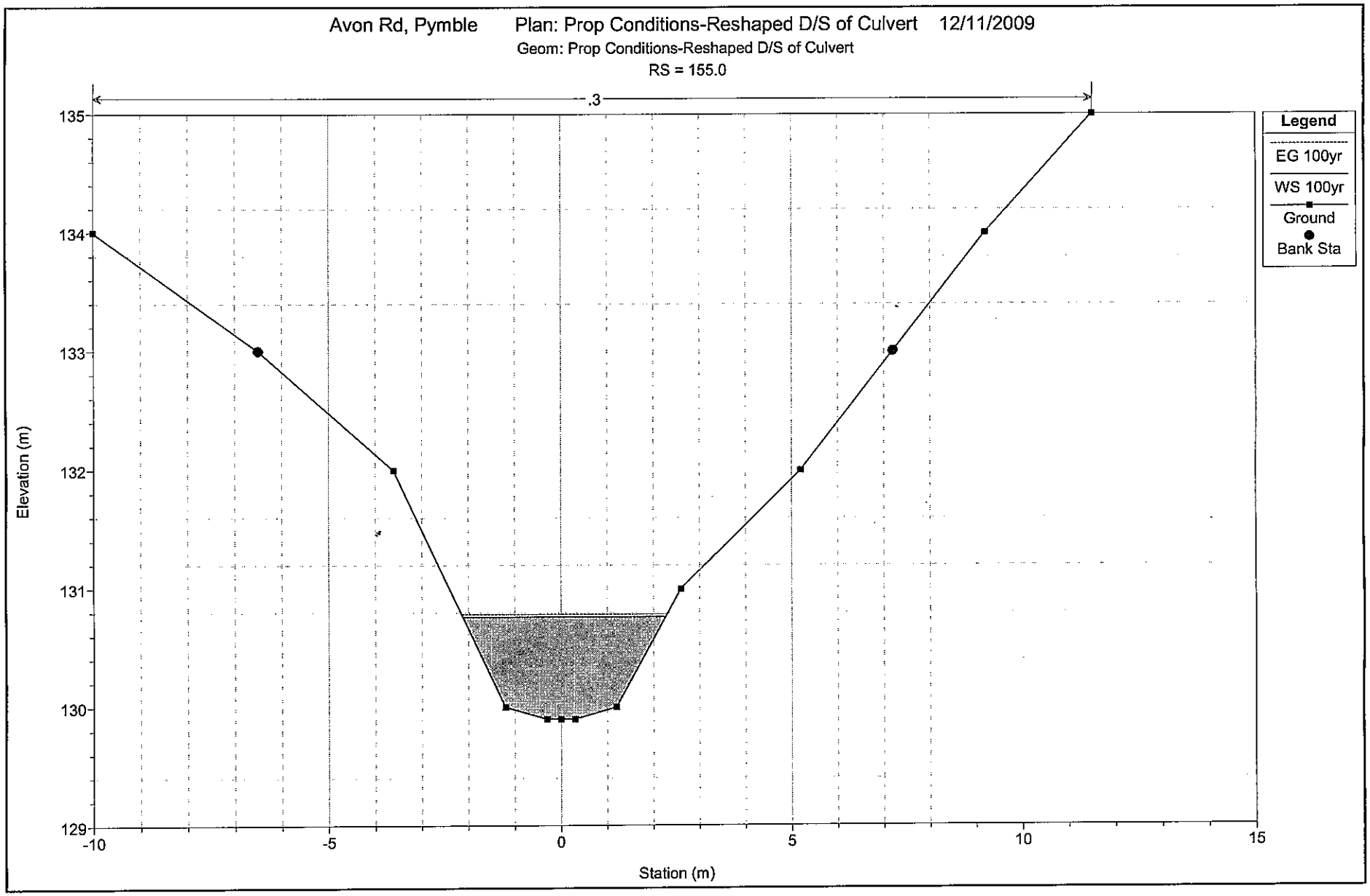

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
Creek Avon Rd
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Elevation (m)
Main Channel Distance (m)
140
135
130
125
120
115
110
-100
-50
0
50
100
150
200
250
-80.60
-70.60
-65.60
-55.10
-46.80
-42.00
-34.00
-19.50
-14.00
4.0
14.00
20.0
29.0
43.0
65.0
81.00
97.5
125.0
136.0
155.0
169.00
175
200.0

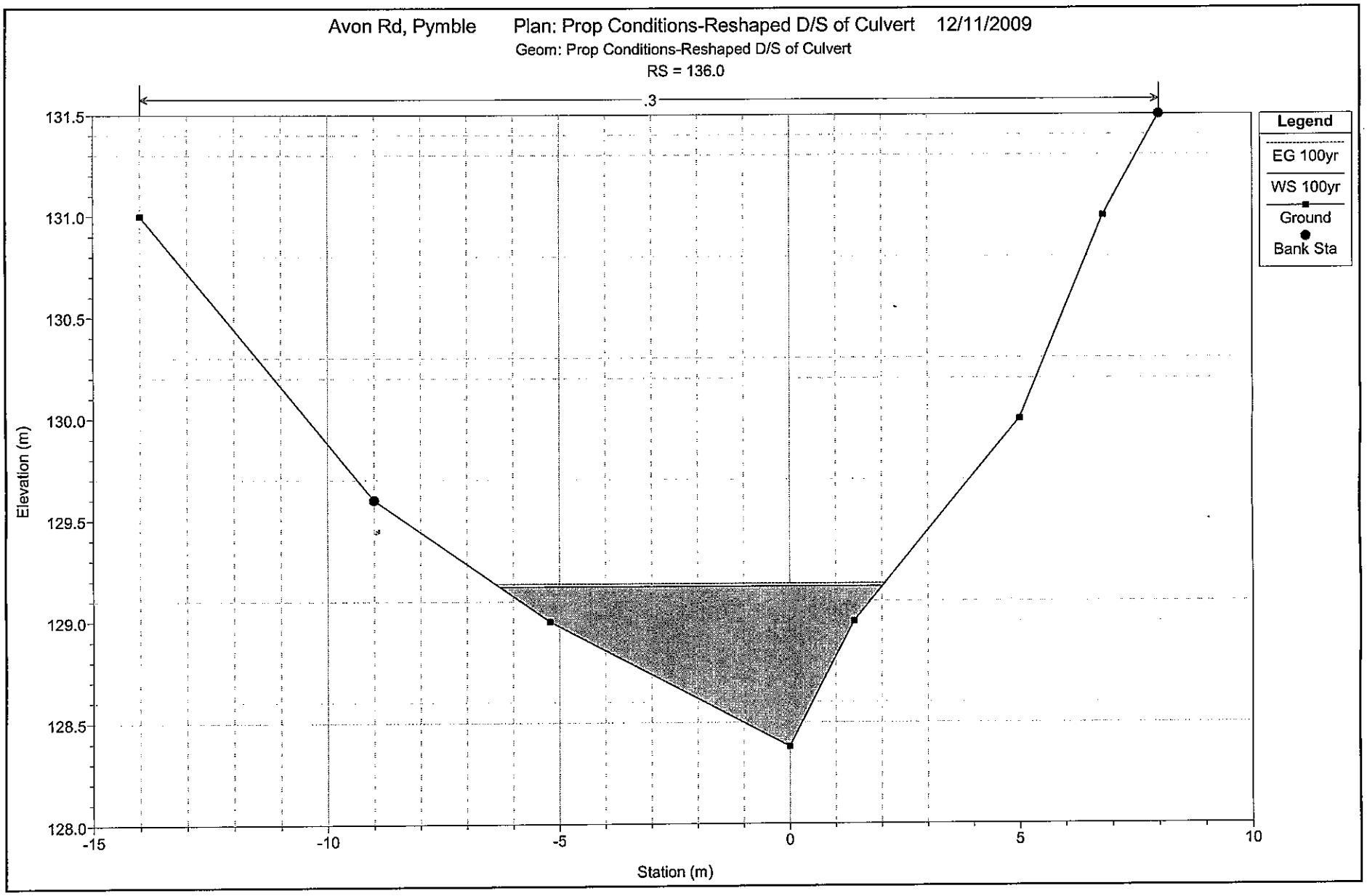
HEC-RAS Plan: PrREshDSCul River: Creek Reach: Avon Rd Profile: 100yr

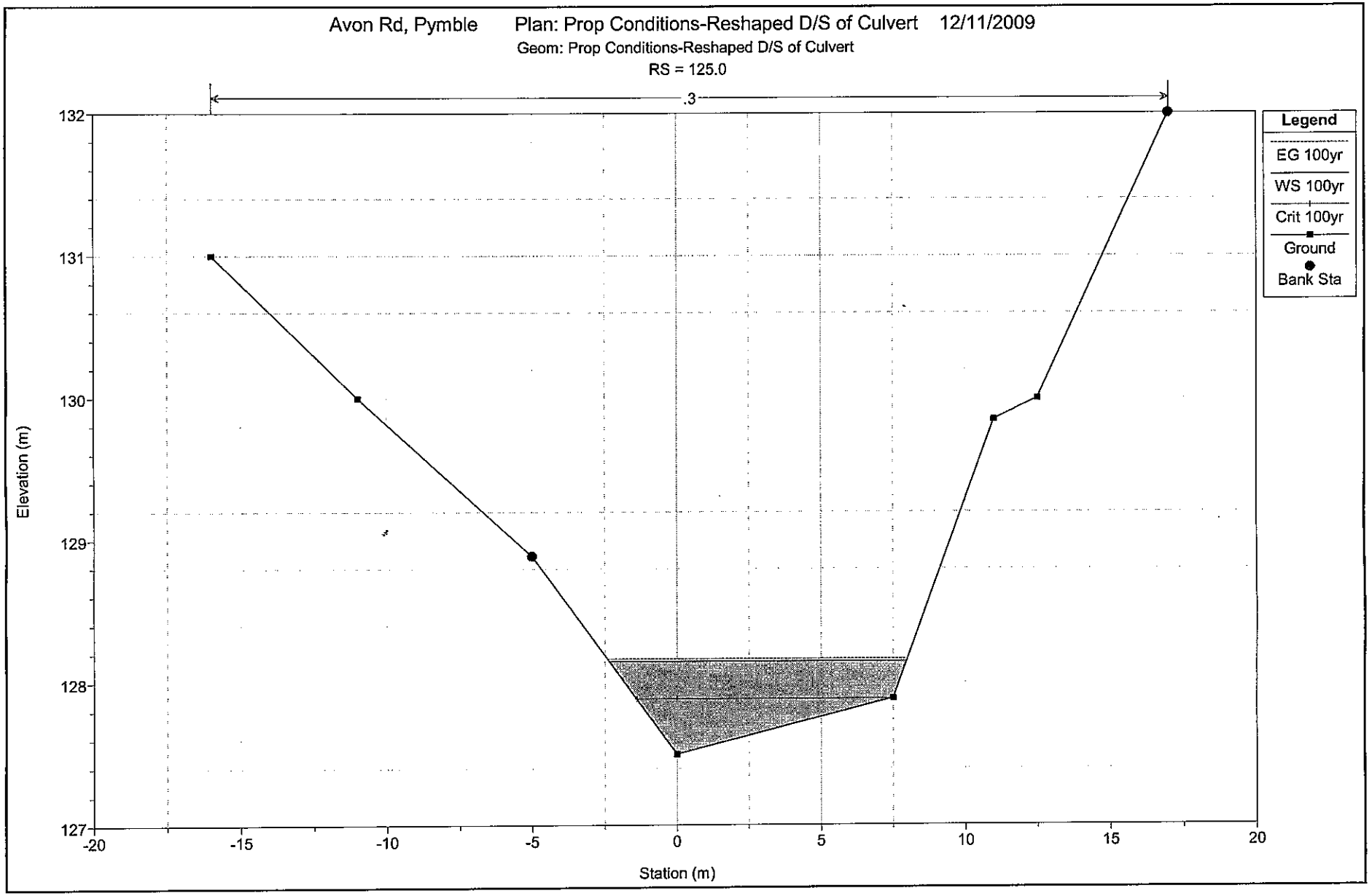
Reach	River Sta	Q Total	Q Left	Q Channel	Q Right	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m3/s)	(m3/s)	(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Avon Rd	200.0	1.73		1.73		139.50	139.78	139.78	139.85	1.706970	1.23	1.41	9.37	1.01
Avon Rd	175	1.76		1.76		132.90	133.61	133.25	133.63	0.081583	0.58	3.05	6.21	0.26
Avon Rd	169.00	1.76		1.76		132.00	132.72	132.50	132.77	0.309020	0.99	1.77	4.12	0.48
Avon Rd	155.0	1.76		1.76		129.90	130.76		130.79	0.080698	0.64	2.74	4.39	0.26
Avon Rd	136.0	1.76		1.76		128.38	129.17		129.19	0.087556	0.53	3.34	8.32	0.27
Avon Rd	125.0	2.41		2.41		127.50	128.15	127.89	128.17	0.096902	0.57	4.24	10.31	0.28
Avon Rd	97.5	2.41		2.41		125.25	126.17		126.18	0.055706	0.48	5.06	10.55	0.22
Avon Rd	81.00	2.41		2.41		124.00	124.75		124.77	0.119483	0.59	4.06	10.85	0.31
Avon Rd	65.0	2.41		2.41		122.80	123.69		123.70	0.042173	0.46	5.29	9.51	0.19
Avon Rd	43.0	2.41		2.41		121.25	122.31		122.33	0.100696	0.68	3.54	6.49	0.29
Avon Rd	29.0	2.41	0.04	2.37		119.41	120.18		120.22	0.246484	0.93	2.67	7.21	0.45
Avon Rd	24.0	2.41		2.37	0.04	118.50	120.15		120.16	0.003527	0.20	12.16	12.70	0.06
Avon Rd	20.0	2.41	1.27	0.97	0.17	118.72	120.11		120.12	0.042852	0.50	5.66	10.50	0.15
Avon Rd	14.00	1.68	1.55	0.13		118.44	119.91	119.87	119.98	0.011469	0.09	2.83	14.23	0.06
Avon Rd	4.0	1.68		1.68	0.00	119.40	119.58	119.53	119.61	0.710796	0.83	2.04	13.35	0.66
Avon Rd	-14.00	2.11		2.06	0.05	118.17	118.49	118.49	118.65	0.021070	1.77	1.52	5.80	0.99
Avon Rd	-19.50	2.11		2.10	0.01	117.50	117.66	117.82	118.31	0.282757	3.58	0.64	5.80	2.83
Avon Rd	-34.00	2.11	0.00	2.10	0.01	116.30	117.01	116.61	117.02	0.000303	0.50	4.34	8.50	0.21
Avon Rd	-42.00	2.64		2.59	0.05	116.10	116.99		117.01	0.014091	0.54	5.08	8.49	0.22
Avon Rd	-46.80	2.64		2.62	0.02	116.16	116.98		116.99	0.001361	0.54	5.51	9.39	0.21
Avon Rd	-55.10	2.64	0.47	2.16	0.01	116.17	116.98		116.99	0.000480	0.40	7.73	17.99	0.15
Avon Rd	-65.60	2.64	1.42	1.21	0.00	116.47	116.97		116.98	0.000747	0.41	6.69	20.44	0.21
Avon Rd	-70.60	2.64		2.64		116.50	116.95		116.97	0.002200	0.64	4.14	15.83	0.40
Avon Rd	-80.60	2.64		2.64		116.47	116.83	116.83	116.92	0.016207	1.34	1.97	11.06	1.01

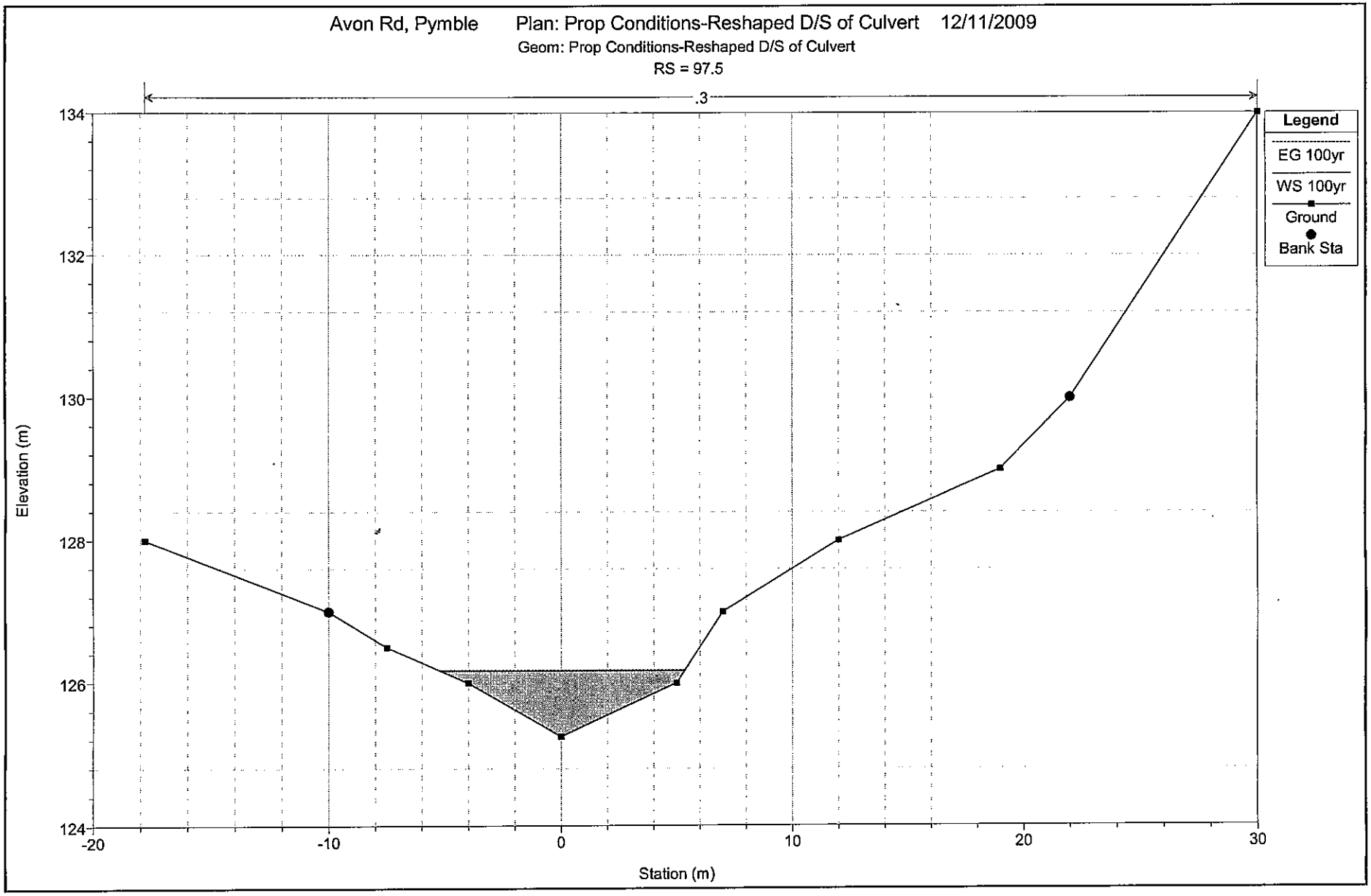

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 175
.3
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
140
139
138
137
136
135
134
133
132
-15
-10
-5
0
5
10
15
20

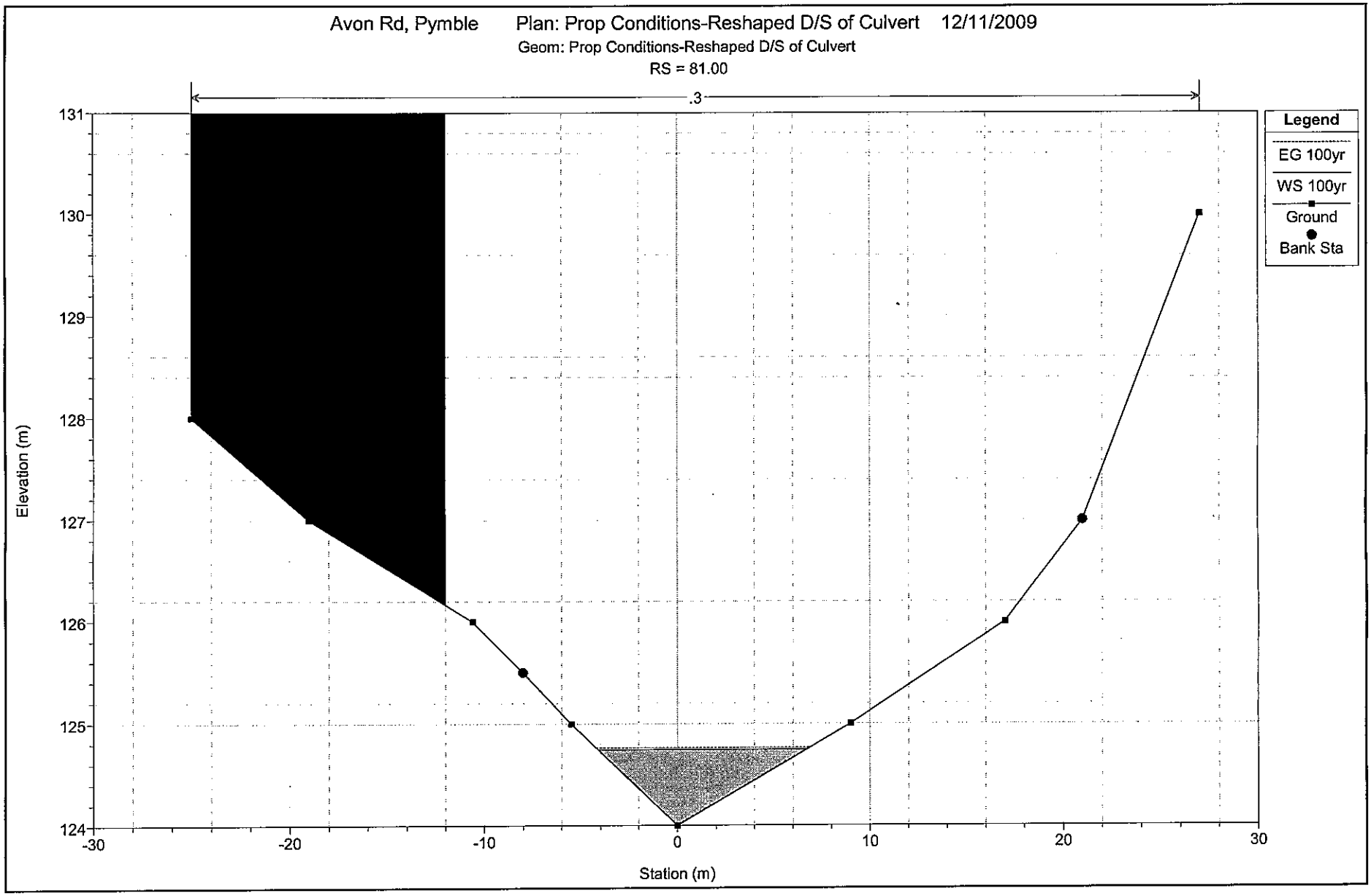

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 169.00
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
136
135
134
133
132
-15
-10
-5
0
5
10
Station (m)

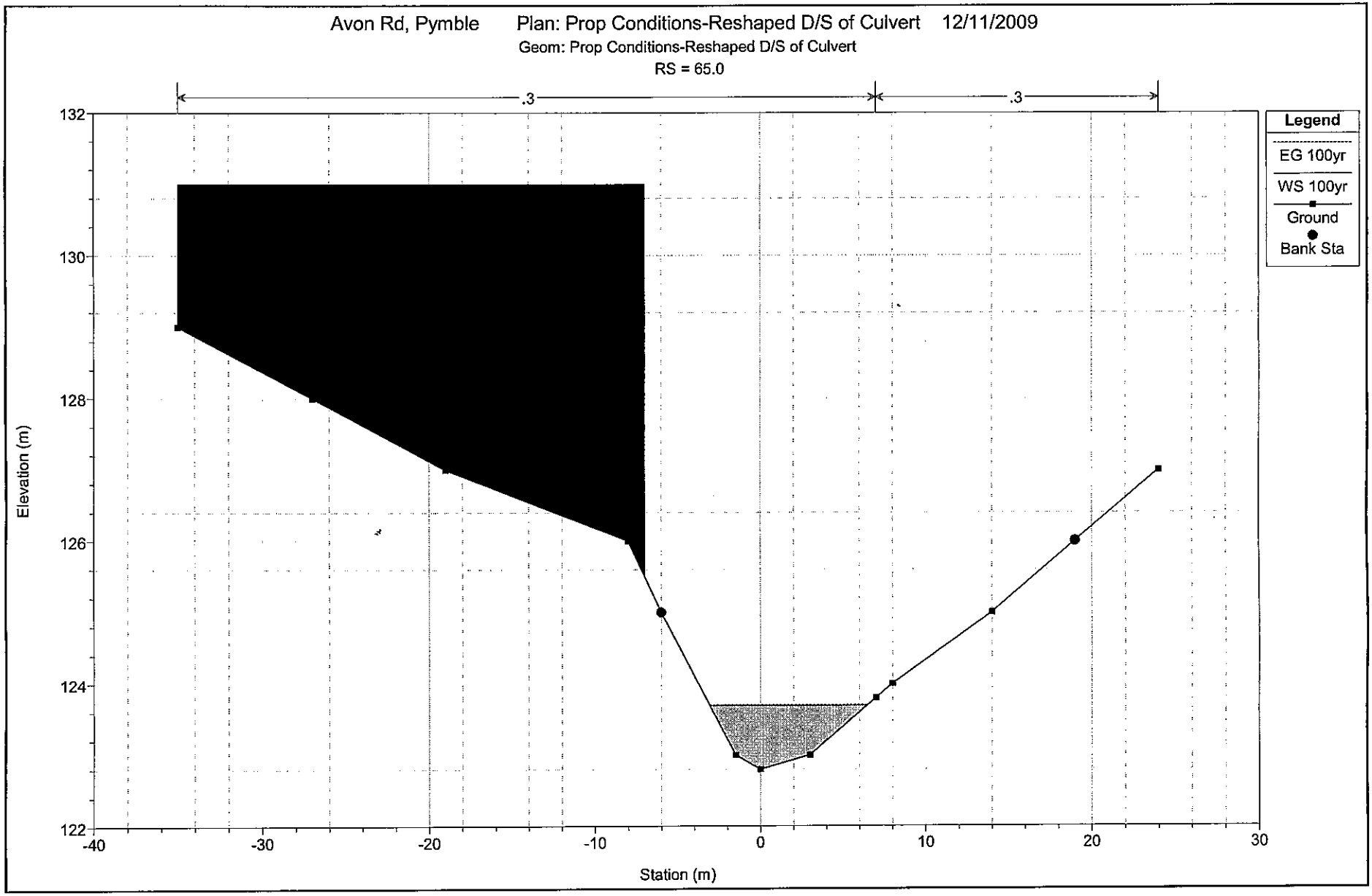

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 155.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
135
134
133
132
131
130
129
-10
-5
0
5
10
15

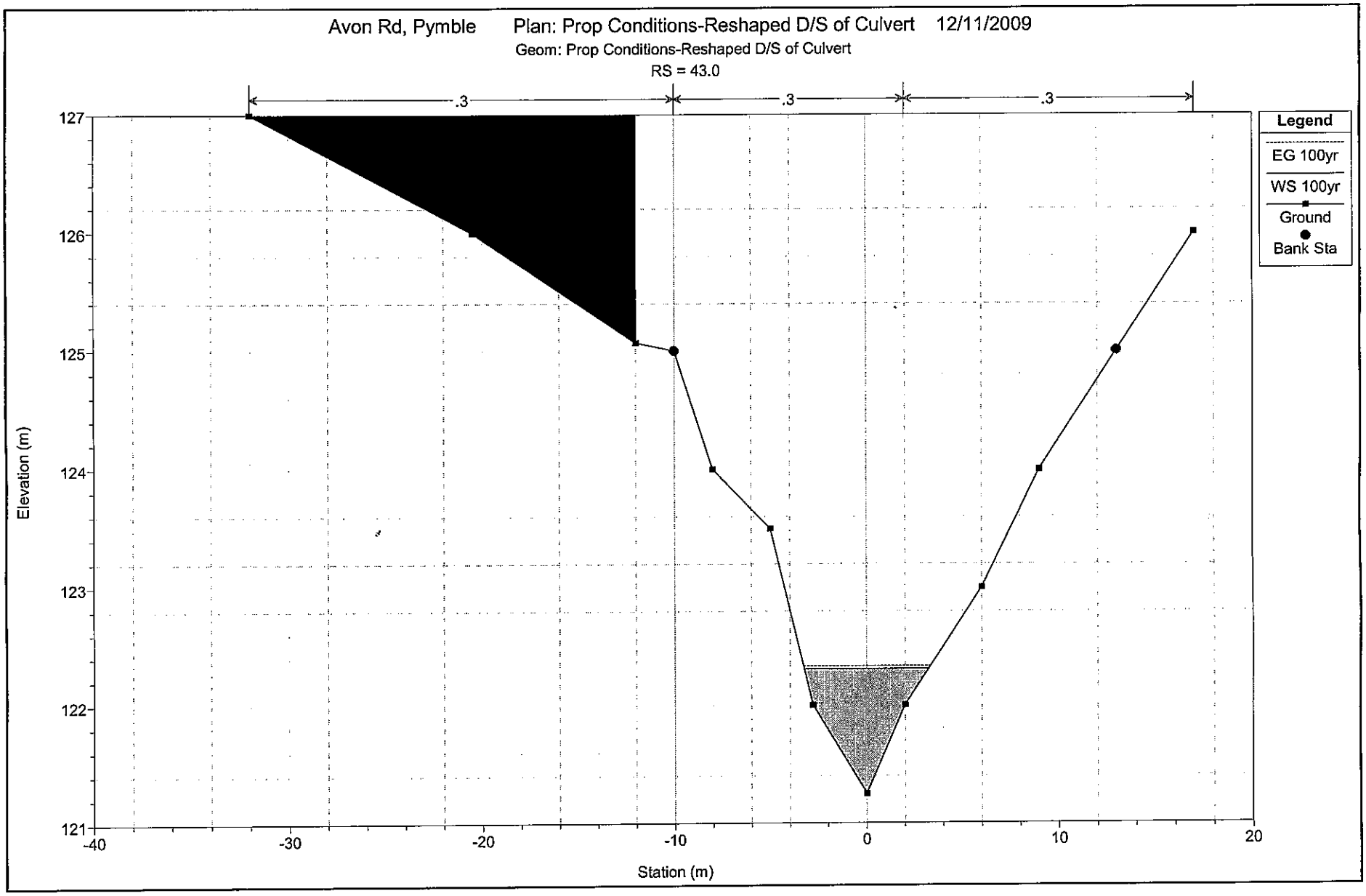

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 136.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
131.5
131.0
130.5
130.0
129.5
129.0
128.5
128.0
-15
-10
-5
0
5
10
Station (m)

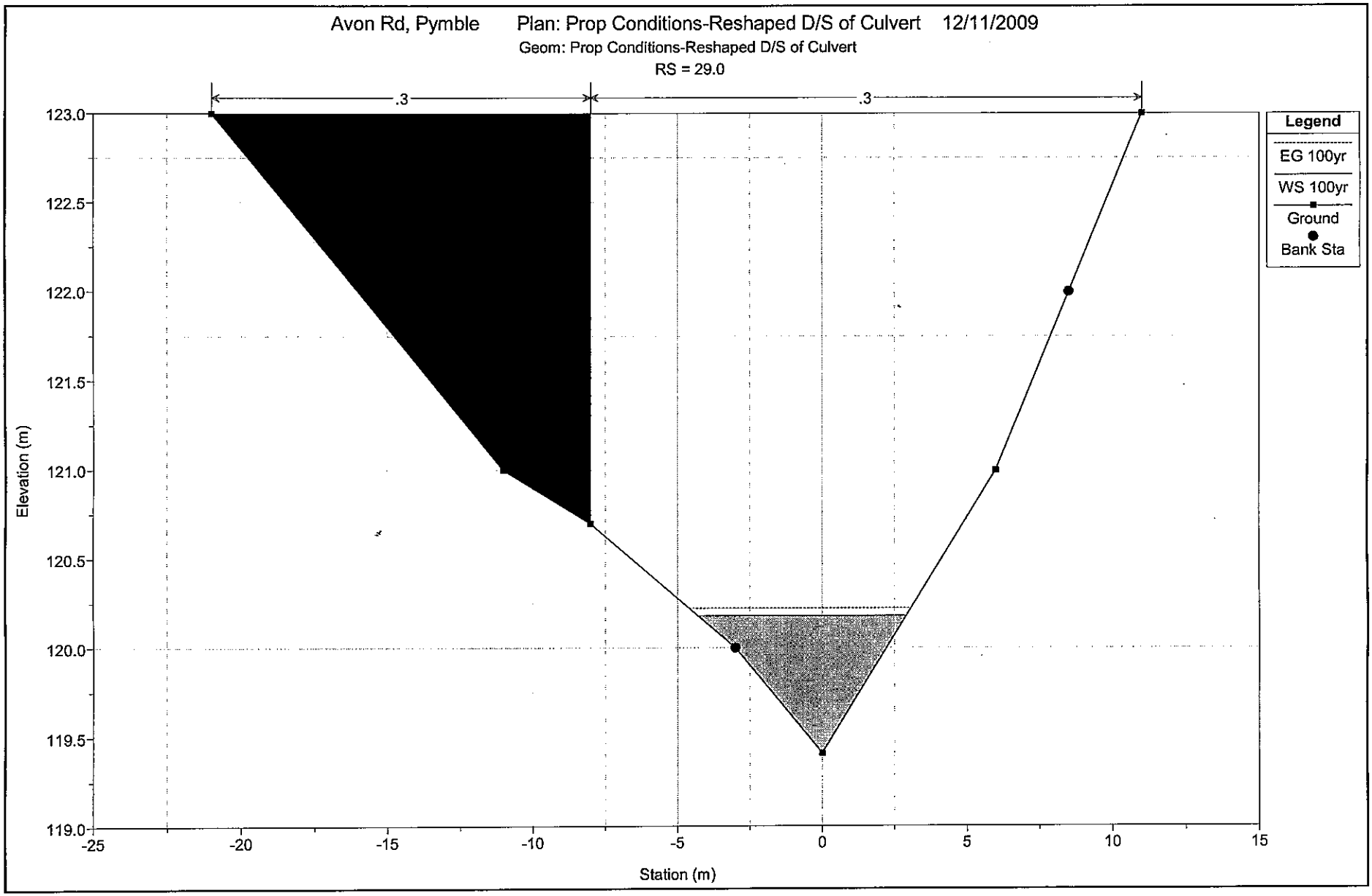

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 125.0
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
132
131
130
129
128
127
-20
-15
-10
-5
0
5
10
15
20

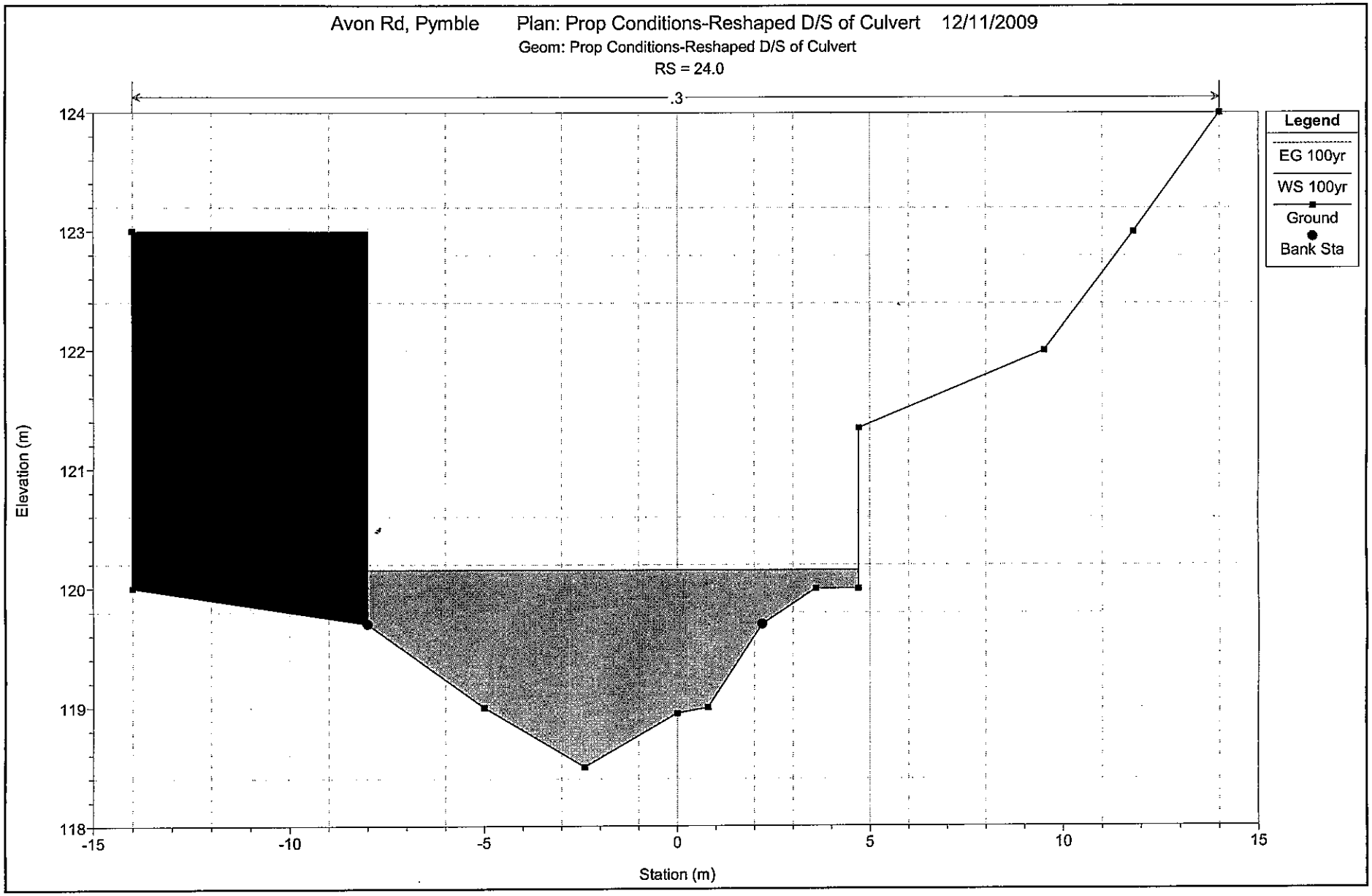

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 97.5
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
134
132
130
128
126
124
-20
-10
0
10
20
30
Station (m)

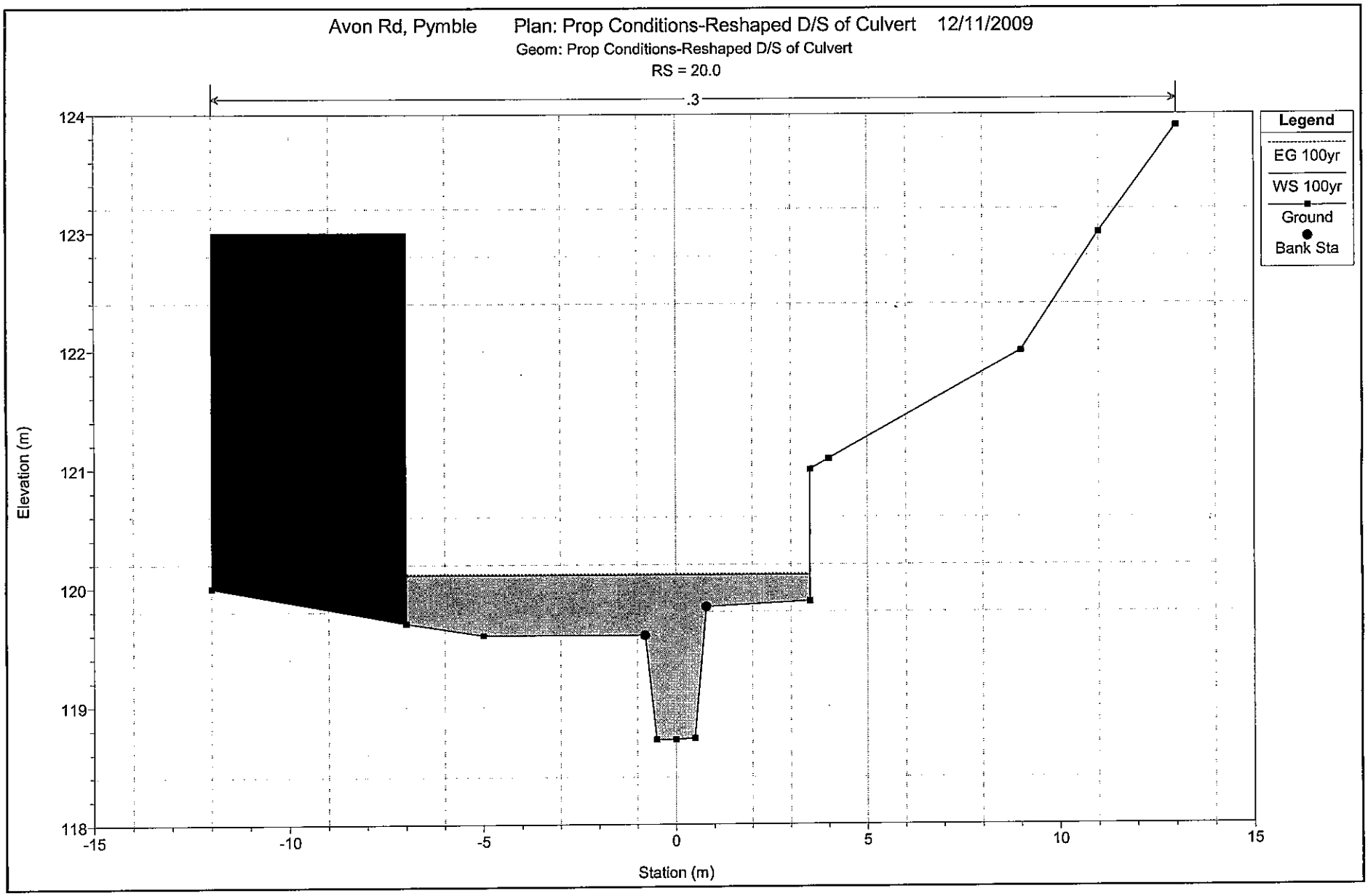

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 81.00
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
131
130
129
128
127
126
125
124
-30
-20
-10
0
10
20
30
Station (m)

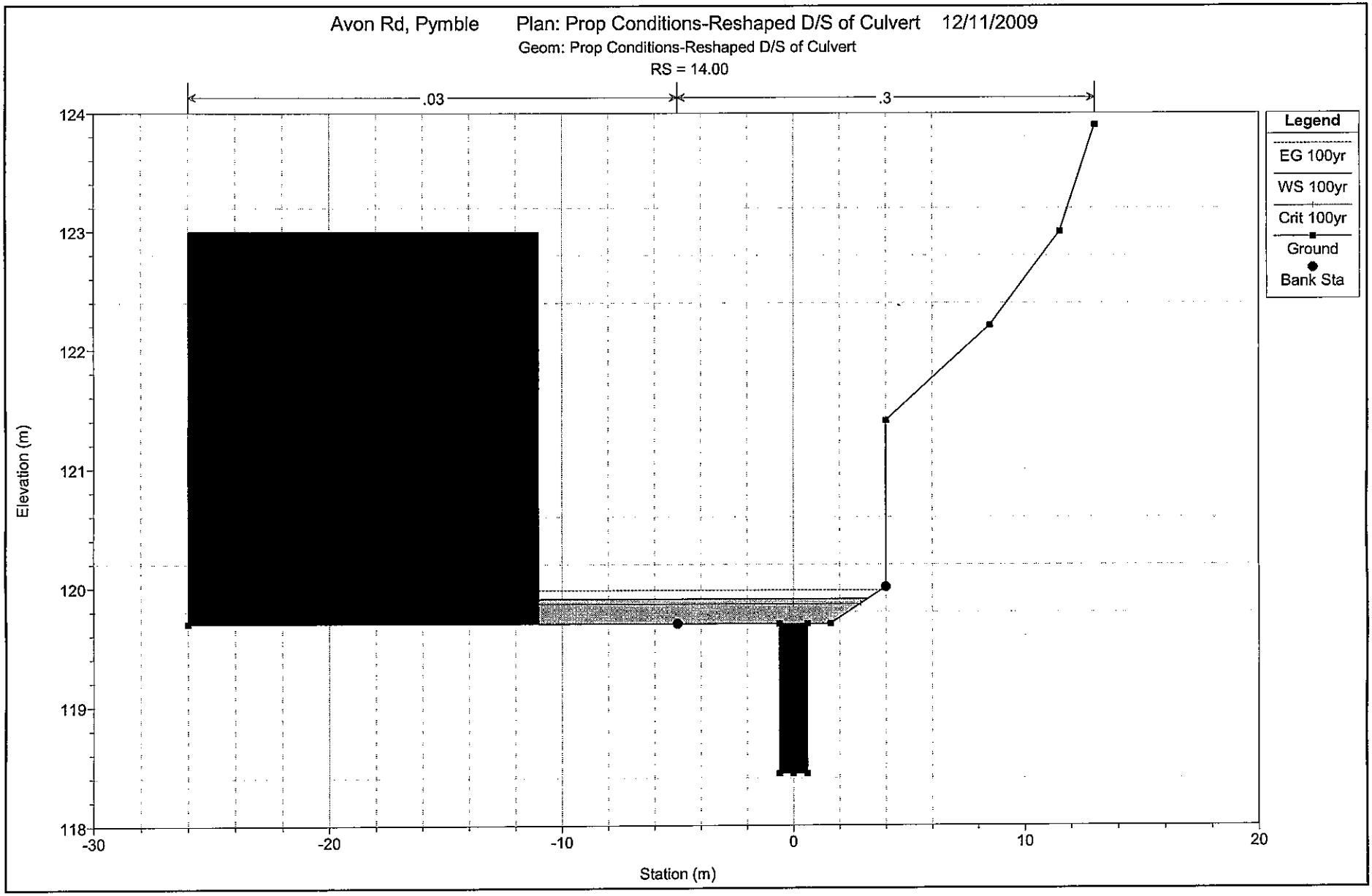

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 65.0
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
132
130
128
126
124
122
-40
-30
-20
-10
0
10
20
30

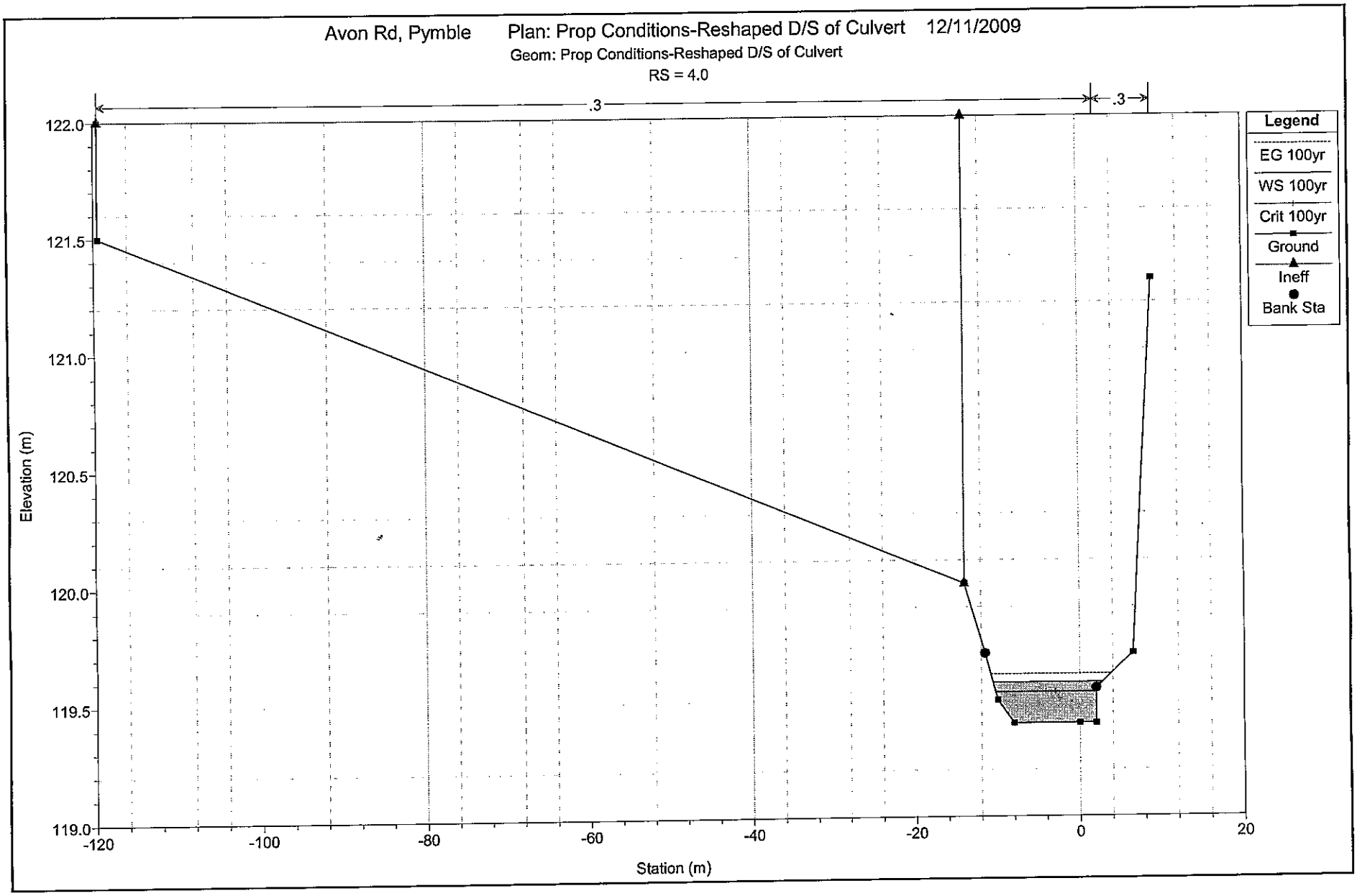

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 43.0
.3
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
127
126
125
124
123
122
121
-40
-30
-20
-10
0
10
20

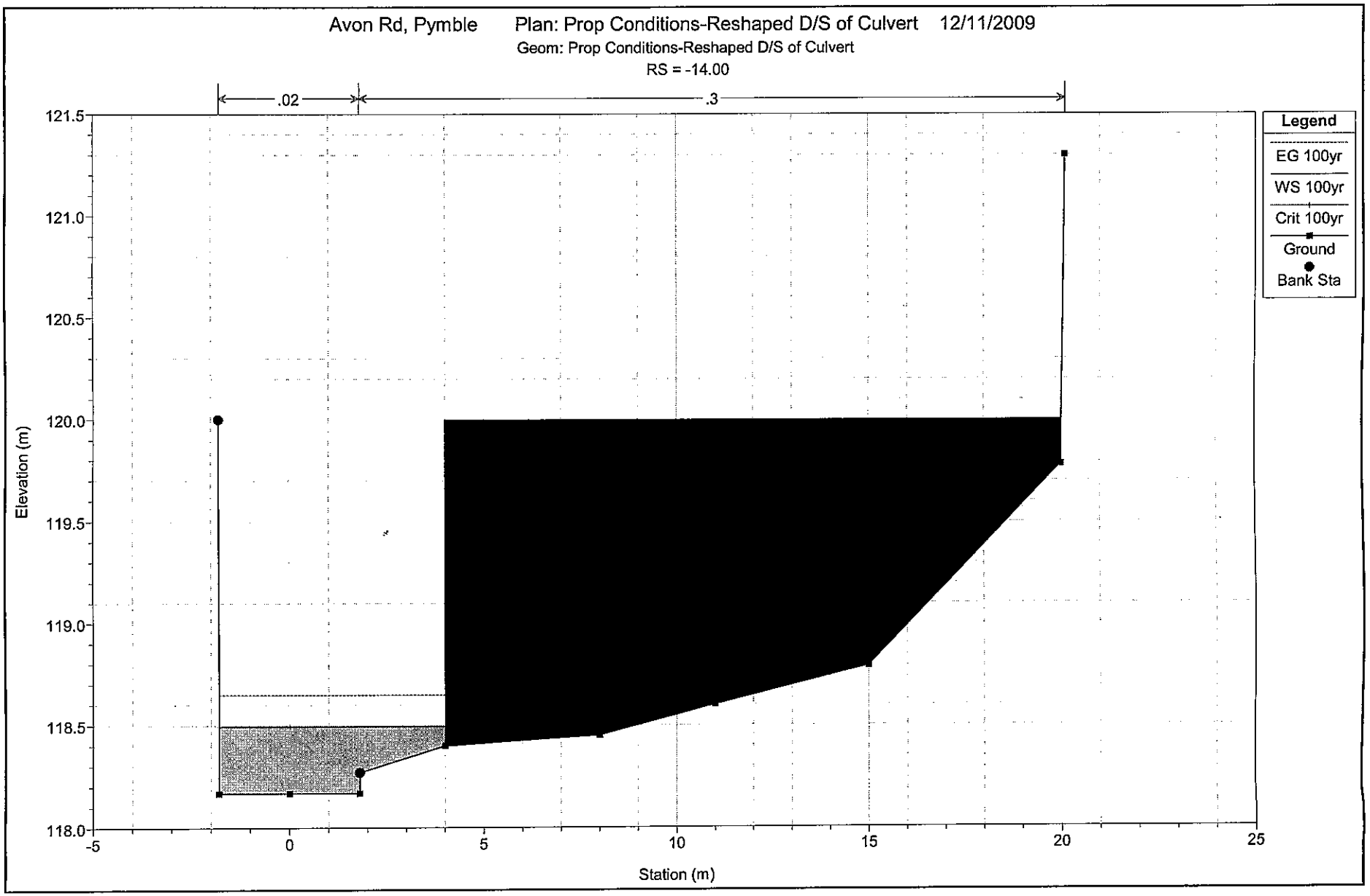

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 29.0
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
123.0
122.5
122.0
121.5
121.0
120.5
120.0
119.5
119.0
-25
-20
-15
-10
-5
0
5
10
15
Station (m)

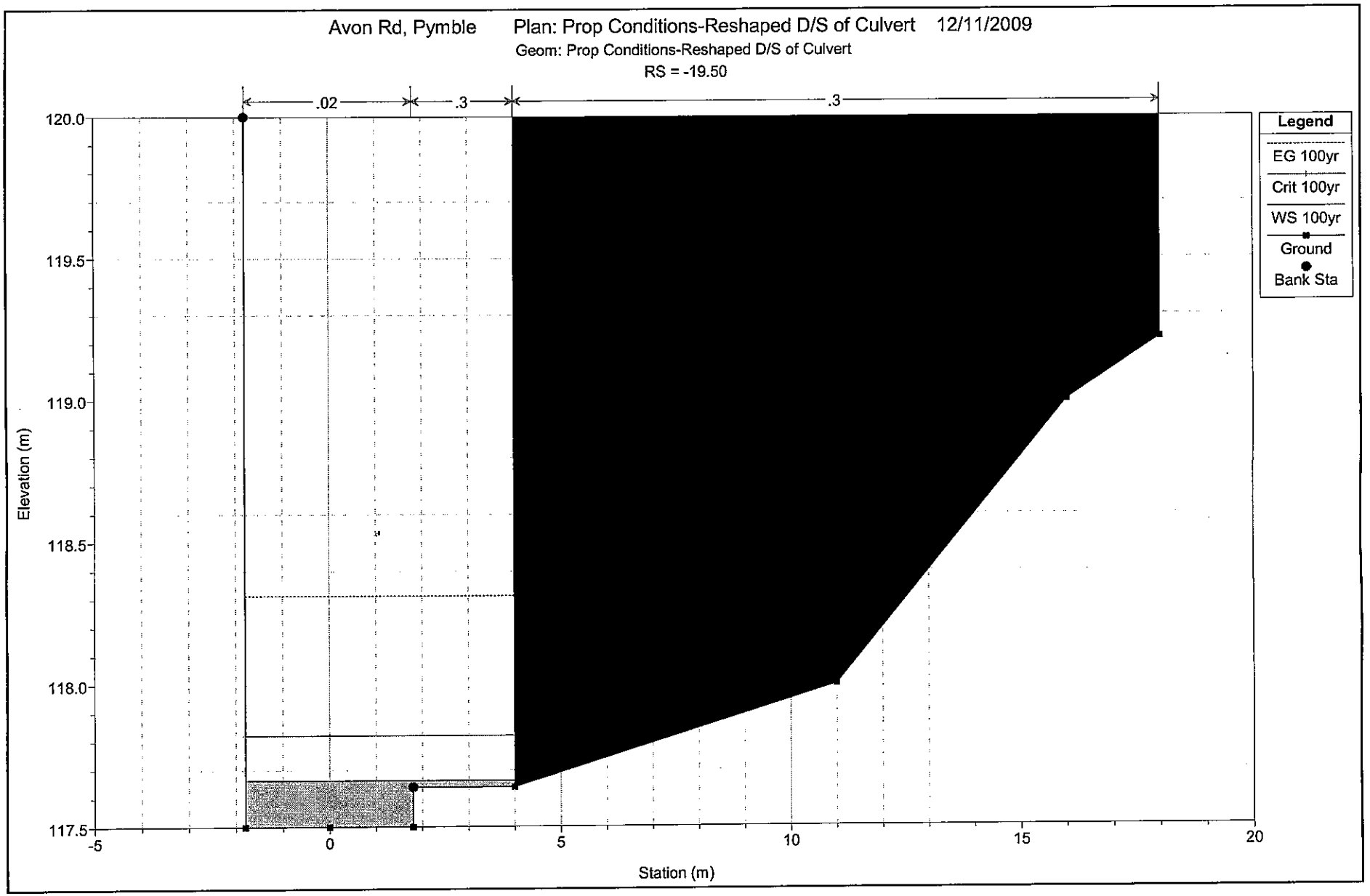

Avon Rd, Pymble Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 24.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
124
123
122
121
120
119
118
-15
-10
-5
0
5
10
15

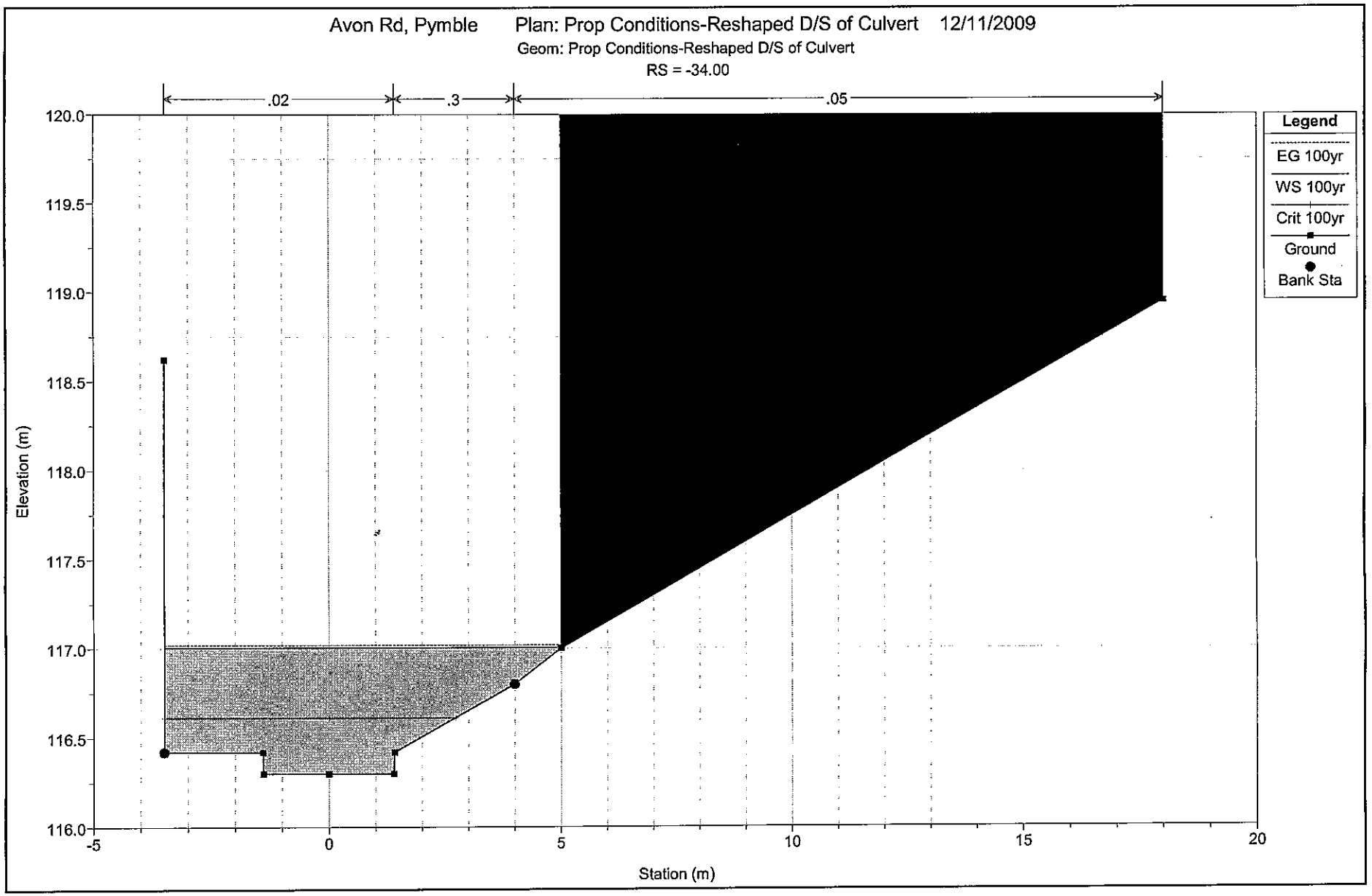

Avon Rd, Pymble Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 20.0
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
124
123
122
121
120
119
118
-15
-10
-5
0
5
10
15

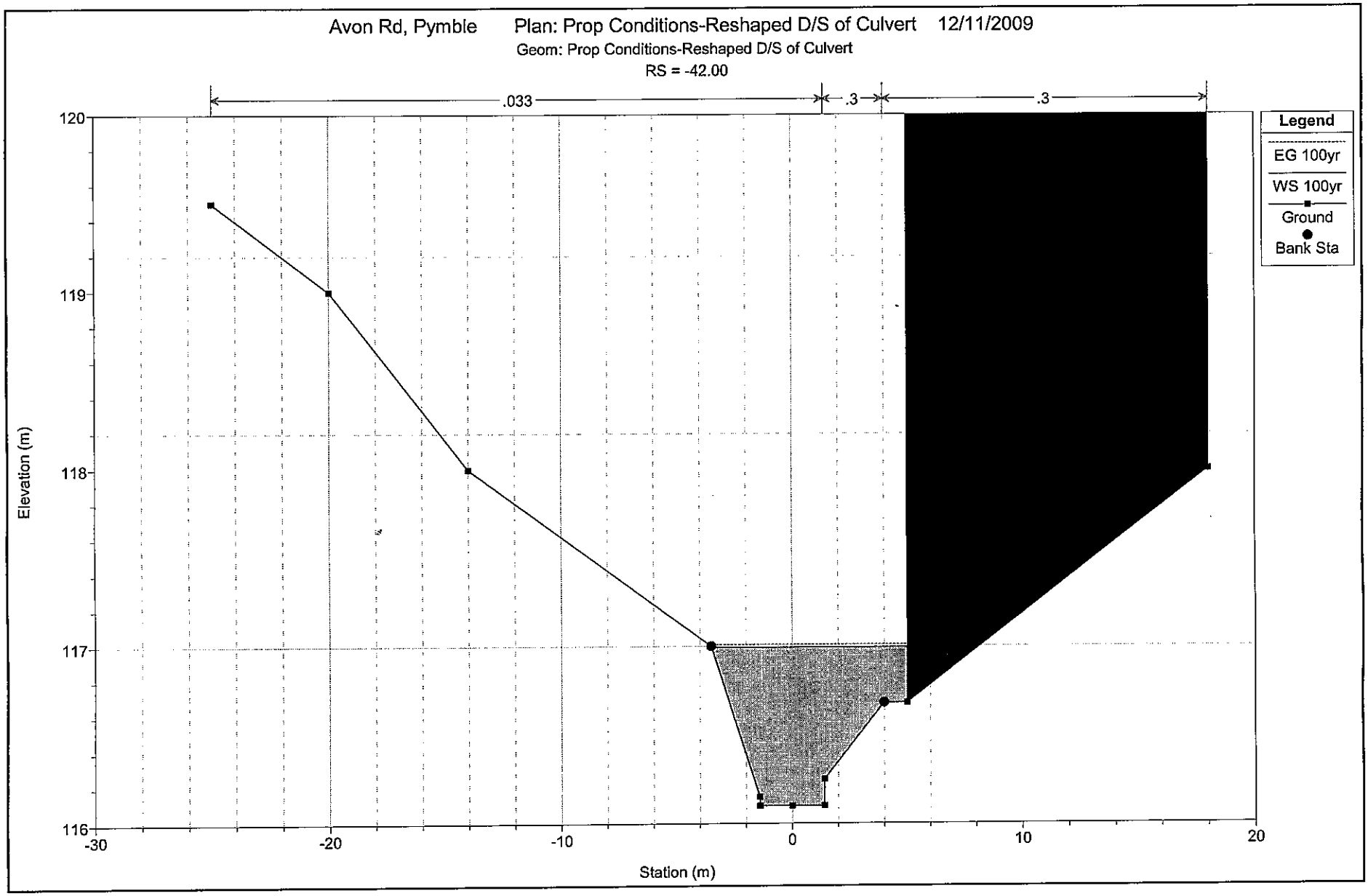

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 14.00
.03
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
124
123
122
121
120
119
118
-30
-20
-10
0
10
20

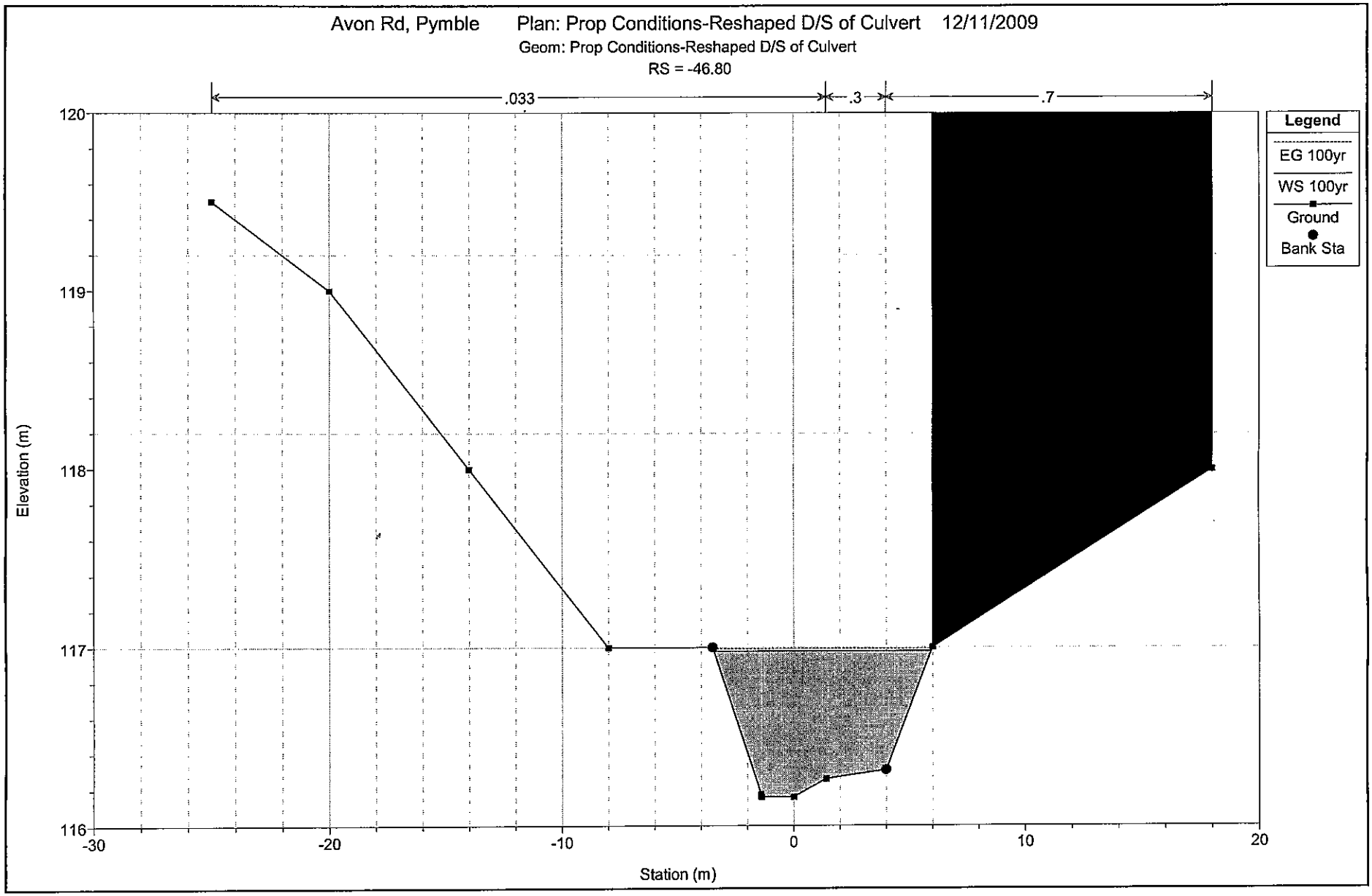

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = 4.0
.3
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Ineff
Bank Sta
Elevation (m)
122.0
121.5
121.0
120.5
120.0
119.5
119.0
-120
-100
-80
-60
-40
-20
0
20
Station (m)

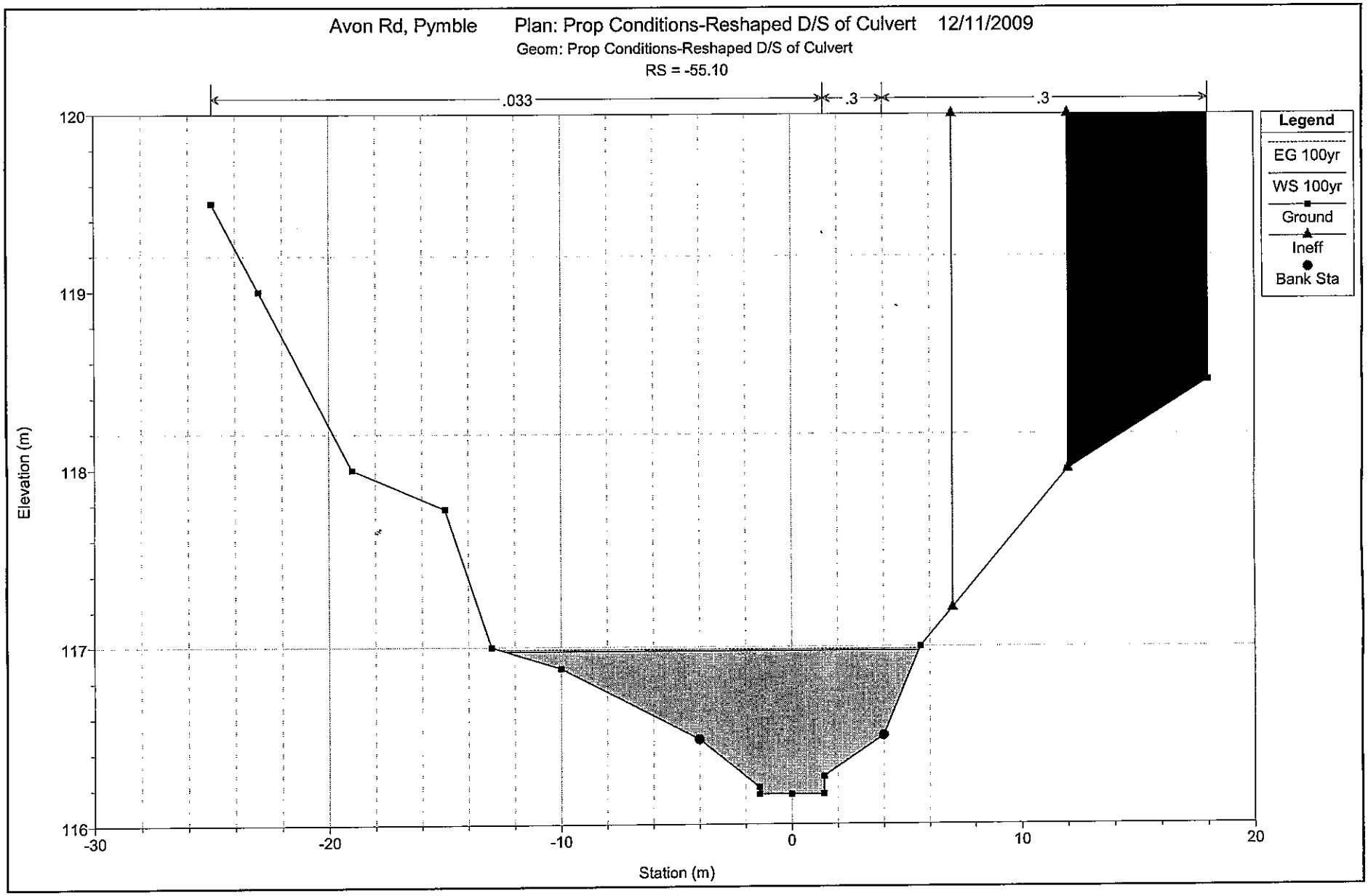

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -14.00
.02
.3
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
121.5
121.0
120.5
120.0
119.5
119.0
118.5
118.0
-5
0
5
10
15
20
25

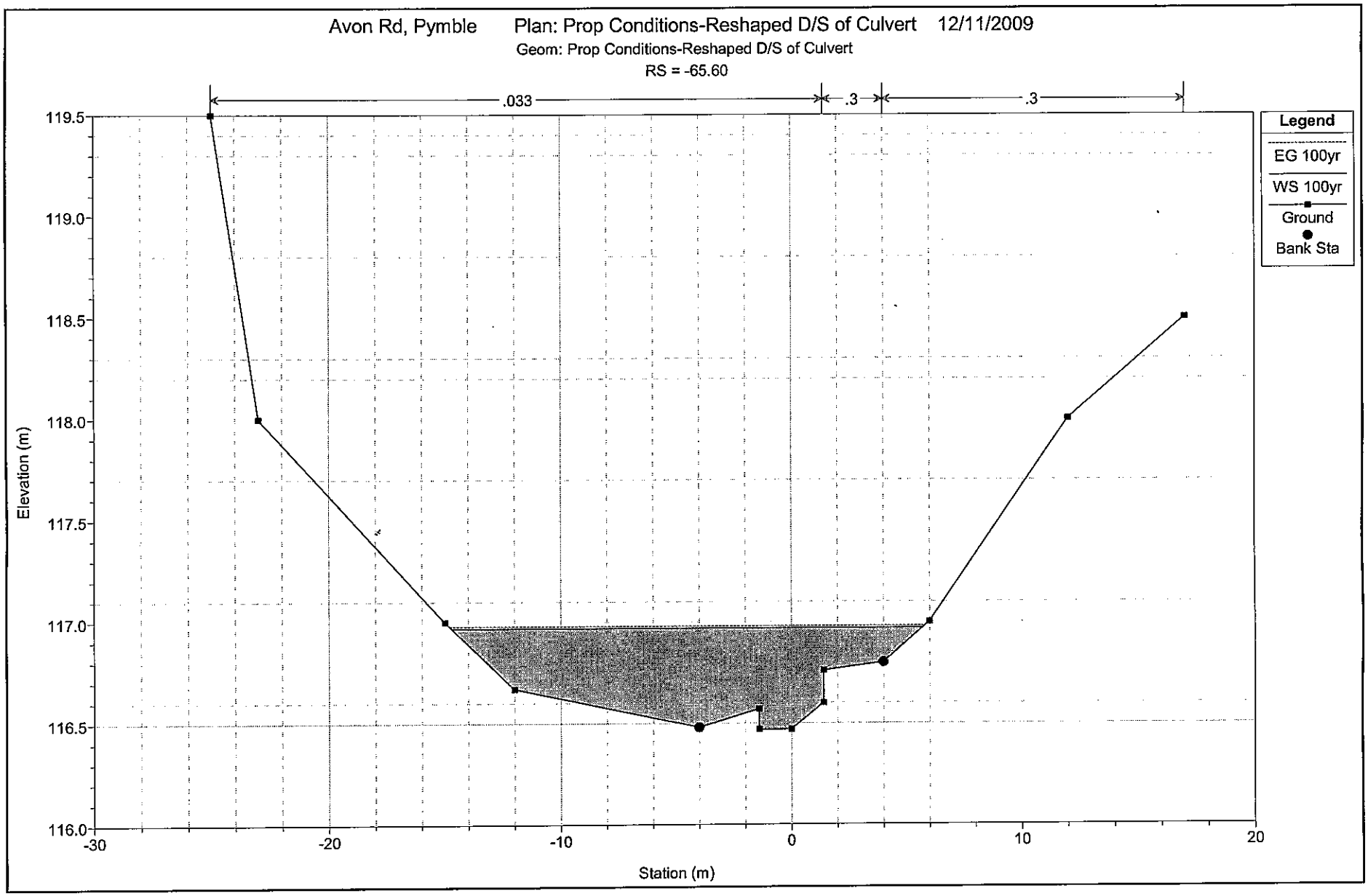

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -19.50
.02
.3
.3
Legend
EG 100yr
Crit 100yr
WS 100yr
Ground
Bank Sta
120.0
119.5
119.0
118.5
118.0
117.5
Elevation (m)
-5
0
5
10
15
20
Station (m)

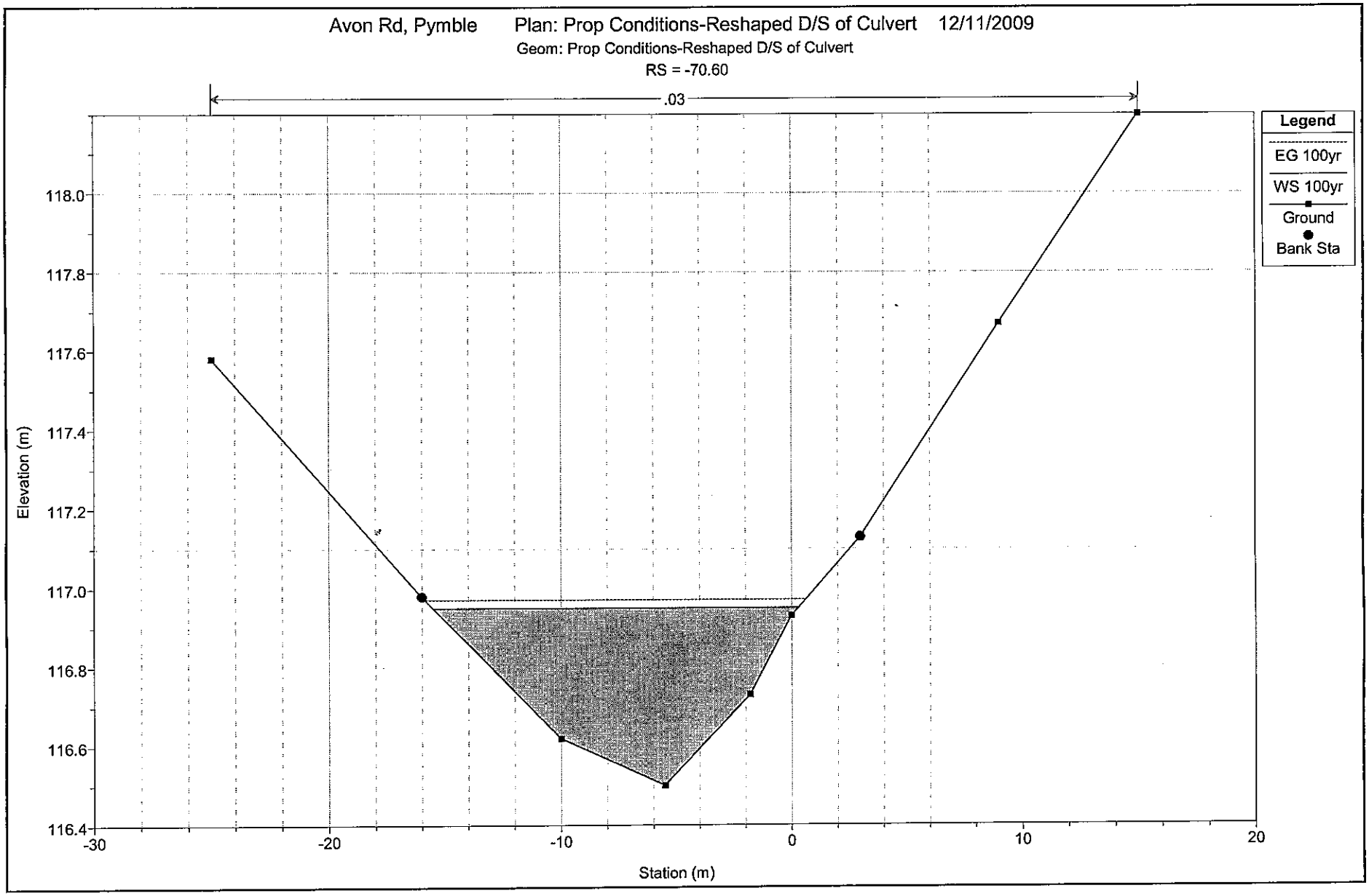

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -34.00
.02
.3
.05
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
120.0
119.5
119.0
118.5
118.0
117.5
117.0
116.5
116.0
-5
0
5
10
15
20
Station (m)

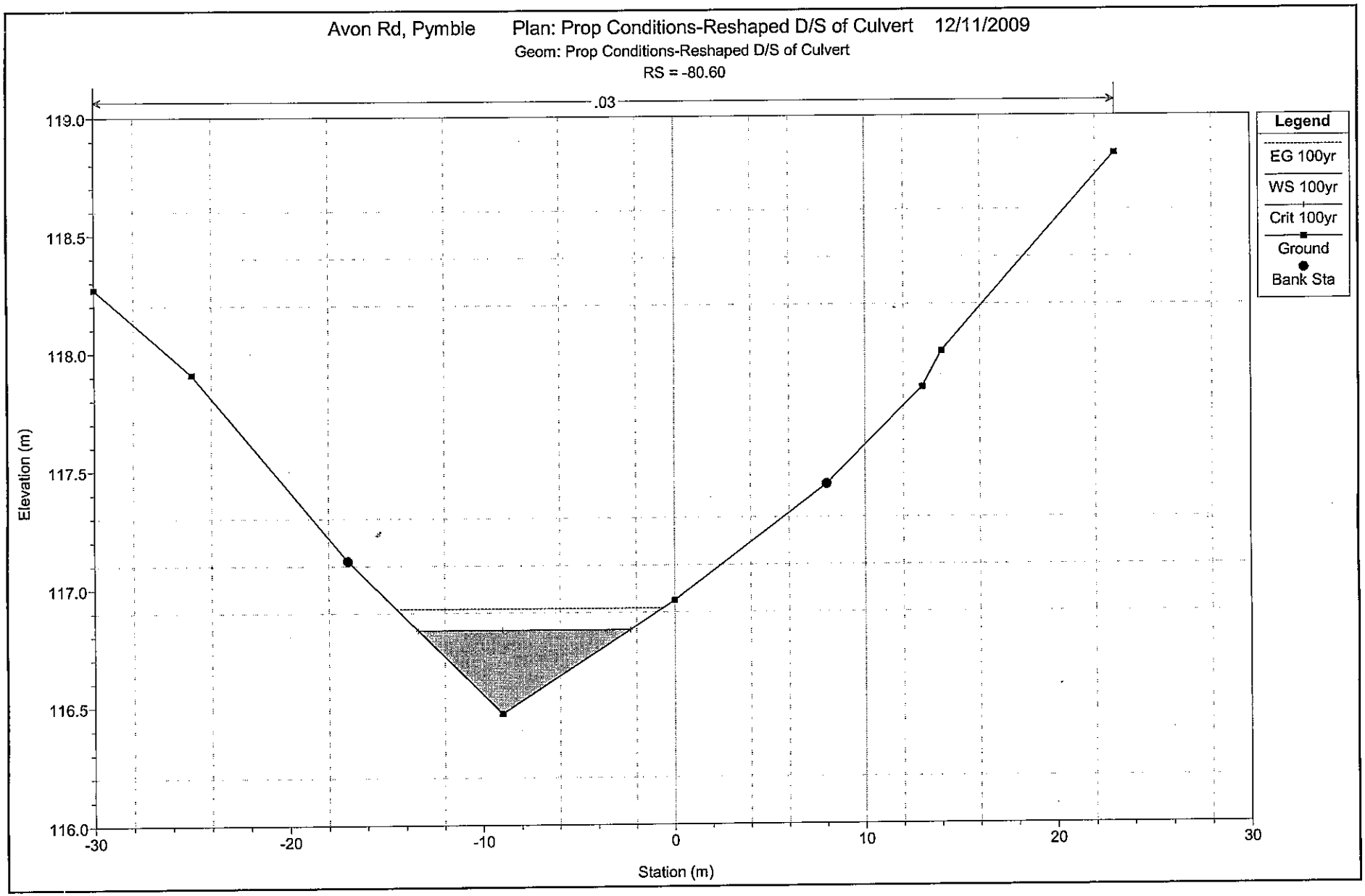

Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -42.00
.033
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
120
119
118
117
116
-30
-20
-10
0
10
20
Station (m)


Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -46.80
.033
.3
.7
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
120
119
118
117
116
-30
-20
-10
0
10
20
Station (m)


Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -55.10
.033
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Ineff
Bank Sta
Elevation (m)
120
119
118
117
116
-30
-20
-10
0
10
20
Station (m)


Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -65.60
.033
.3
.3
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
119.5
119.0
118.5
118.0
117.5
117.0
116.5
116.0
-30
-20
-10
0
10
20
Station (m)


Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -70.60
.03
Legend
EG 100yr
WS 100yr
Ground
Bank Sta
Elevation (m)
118.0
117.8
117.6
117.4
117.2
117.0
116.8
116.6
116.4
-30
-20
-10
0
10
20
Station (m)


Avon Rd, Pymble
Plan: Prop Conditions-Reshaped D/S of Culvert 12/11/2009
Geom: Prop Conditions-Reshaped D/S of Culvert
RS = -80.60
.03
Legend
EG 100yr
WS 100yr
Crit 100yr
Ground
Bank Sta
Elevation (m)
Station (m)
119.0
118.5
118.0
117.5
117.0
116.5
116.0
-30
-20
-10
0
10
20
30